INDIANA HIGH SCHOOL STUDENTS' OUTCOMES AND UBIQUITOUS TECHNOLOGY

A DISSERTATION

SUBMITTED TO THE GRADUATE SCHOOL

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE

DOCTOR OF EDUCATION

BY

MARK J. HALL

DR. JOSEPH MCKINNEY - ADVISOR

BALL STATE UNIVERSITY

MUNCIE, INDIANA

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CHAPTER ONE: INTRODUCTION

Labaree (1987) stated that there are three primary purposes of education: democratic equality, social efficiency, and social mobility. For schools to meet the demands of an ever-changing society and to be able to fulfill these primary purposes of education, they must adapt to the changing times and explore innovative new practices. Schools around the world are discussing and implementing ubiquitous technology environments into their classrooms. For this study, ubiquitous technology refers to an environment where students have access to technology both at school and at home.

These initiatives are commonly known as 1:1 technology learning environments, where each student has a mobile digital learning resource at their disposal. Across multiple studies, the four primary goals for 1:1 technology learning initiatives include: improved academic performance, digital equity, economic development, and enhanced teaching (Fadel & Lemke, 2006; Hew & Brush, 2007; Swallow, 2015). According to data provided by the Indiana Department of Education division of E-Learning, 271 school districts in Indiana have launched some form of ubiquitous technology learning initiative (IDOE Elearning, 2017). The data from the Indiana Department of Education indicated that there is very little consistency in the implementation of these programs across the state. As a result, the self-reported data seemed to suggest that there are distinct variations that exist between and across grade levels, subject areas, pedagogies, devices, and policies across the state.

Background

Throughout history, schools have been blamed for and yet also seen as a solution to the individual and systemic problems of our society. As a result, school leaders, school reformers, and policymakers have looked continuously to improve and infuse innovation into our education system. According to Cuban (2009), since the early 1980's, there has been a loosely formed national coalition of public officials, corporate executives, vendors, policymakers, educators, and parents that share the same common goal of creating more access to new technologies in schools for various reasons. What is clear is that each coalition member's reason for increased access is dependent on their perspectives and perceived gains.

Many corporate executives and vendors have sought to increase the usage of technology in schools so that they can benefit and gain personally from the profit associated with selling hardware devices and software programs. Secondly, some participants in this loose coalition have hoped that increasing technology in schools will fix many of the problems that have historically plagued education. Finally, some within this alliance want to believe that the increase of technology in schools will help to even out social injustices and ensure that poor and minority students with little access to new technologies are not left behind (Cuban, 2009). As is true for many educational reforms, there is substantially more opinion available concerning the implementation of 1:1 technology learning environments than actual research-based facts.

Statement of the Problem

Implementing innovative educational environments for their students is a task faced by all schools. Increased access to information by way of the widely available high-speed Internet, improved wireless networks, and cost-effective mobile devices has led to the widespread

implementation of digital tools in the classroom around the globe. One issue that makes this application difficult is a lack of substantial and conclusive research that could be used to successfully guide the implementation of these very costly initiatives.

Purpose of the Study

The purpose of this study was to identify, analyze, and compare differences in student outcomes between public high schools in Indiana that had implemented 1:1 technology learning environments with those that had not. This study utilized archival student outcome data from the majority of public high schools in Indiana. Stakeholders for this study included students, parents, faculty and staff, and policymakers connected to schools that have implemented a 1:1 technology learning environment or considering a 1:1 technology learning environment, as well as those that have decided against implementing 1:1 technology. For this study, the independent variable was the implementation of a 1:1 technology learning environment. The dependent variables consisted of several traditional school performance metrics including student performance on two different standardized tests in English/Language Arts as well as student attendance and student graduation rates.

Significance of Study

The implementation of a ubiquitous technology initiative is a very cost-intensive undertaking. In some school districts, spending on devices and infrastructure can top several hundreds of thousands of dollars (Shumski, 2014). The research that is available related to implementations and impacts is relatively limited up to this point. Further research is needed to assist policymakers and educational leaders in their efforts to better understand the impacts that ubiquitous technology integration has on student outcomes. More specifically, there is limited

research available on the effects of 1:1 technology learning environments in Indiana (Lemke & Martin, 2004). This study may serve as a resource for policymakers and education leaders as they make decisions related to ubiquitous technology implementation. With a better understanding of student outcomes, school leaders should be better equipped to make and defend decisions associated with integrating 1:1 technologies into the schools which that they are responsible for leading.

Research Questions

The research questions that guided this study were:

1. What is the difference in student academic performance between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?
2. What is the difference in student attendance rates between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?
3. What is the difference in student graduation rates between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?

Delimitations

Delimitations of a study are items that the researcher can control. Primarily, they identify items included as part of a study and what things that have been left out (Roberts, 2010). For this study, the following delimitations were identified.

The first delimitation of this study is that it only compares archival student data from public high schools in Indiana. The public schools selected for this study were both traditional, and charter schools that had completed the 2016 Indiana Technology Plan Survey and that had participated in the Indiana standardized testing program. The data from the selected public high schools in the state were used to draw conclusions about student outcomes and 1:1 technology implementations.

The second delimitation of this study were the standardized measures selected to measure student academic performance. For this study, the following standardized assessments were used to measure student academic performance: Indiana's ISTEP+ English/Language End-of-Course Assessment and Indiana ISTEP+ 10 English/Language Arts. Also, archival student attendance data, graduation rate data, and free/reduced lunch status data were collected analyzed.

Definitions

1:1 Technology. A 1:1 technology implementation is merely a description of the ratio of computers to students within a specific educational environment (Downes & Bishop, 2015).

Apple Classroom of Tomorrow (ACOT). A project that involved the saturation of computers in K-12 classrooms with a research focus on the impacts on students and teachers that had constant access to computers (Dwyer, Ringstaff, & Sandholtz, 1994).

Archival Data. Archival data may be thought of as any sort of information, previously collected by others, amenable to systematic study (Jones, 2010).

Student Attendance Rate. A percentage calculated by dividing the number of days that a student attends school by the total number of required school days in a school year (IN DOE).

Charter School. Charter school means a public elementary school or secondary school established under this article that: (1) is nonsectarian and nonreligious; and (2) operates under a charter (IC 20-24-1-4).

English Language Learner. ELL "English Learner" or "English Language Learner" – This refers to any student who may or may not be in the ENL program, but those who are continuing to acquire the English language (IDOE).

High School. A school with any combination of grades 9, 10, 11, and12 (IC 20-18-2-7).

Individual Education Program. Individualized education program (IEP) means a written statement developed for a child by a group that includes a representative of the school corporation or public agency responsible for educating the child, the child's teacher, the child's parent, guardian, or custodian, if appropriate, the child (IC 20-18-2-9).

Professional Development. To create effective learning environments, teachers need opportunities to learn what instruction and assessment practices, curricular resources, and classroom management skills work best in a 1:1 setting (Dunleavy, Dexter, & Heinecke, 2007).

Public School. A school maintained by a school corporation or a state educational institution (IC 20-18-2-15).

School Year. School year means the period beginning after June 30 of each year and ending before July 1 of the following year except when a different period is specified for a particular purpose (IC 20-18-2-17).

Socio-Economic Status. The social standing or class of an individual or group. It is often measured as a combination of education, income, and occupation (American Psychological Association).

Statewide Assessment Program. For school years ending before July 1, 2018, the ISTEP program is the Indiana Statewide Assessment Program (IC 20-18-2-20.7).

Ubiquitous Technology Environment. A learning environment where technology resources are always present for all students, both at school and at home, is known as a ubiquitous technology environment (Bebell & O'Dwyer, 2010).

Summary

Ubiquitous technology learning initiatives are present across the United States, including Indiana. Approximately 271 different school corporations in Indiana have implemented some form of 1:1 learning environments in their classrooms. The purpose of this study was to determine what impacts immersive technology environments have on the student outcomes of academic achievement, student attendance, and graduation rates. This study included a comprehensive review of current and relevant literature followed by a detailed explanation of the research methodology that was used, results of statistical analysis, and conclusions.

CHAPTER TWO: REVIEW OF LITERATURE

The purpose of this review of current and relevant literature will summarize and explain the recent practive of integrating technology into our schools. Also, it will summarize and synthesize what is known based on research about the implementation, student and teacher impacts, and the systemic impacts related to the increase of access to new technologies in our schools. This chapter presents a conceptual framework that provides perspective to this research. Furthermore, this chapter explores the history of ubiquitous technology in schools and provides a summary of teacher and technology impacts on student outcomes. Chapter Two will conclude with a synthesis of literature on student outcomes related to immersive technology.

Theoretical Framework

The theory that was used to guide this study is the Distributed Cognition Theory. This approach indicates that technology can be used to help extend human capabilities (Bell & Winn, 2000). Distributed cognition explains the accumulation of knowledge that takes place in a classroom and its connection to the cognitive actions made by others in the same learning environment. The role of technology within this theory is an invaluable part of the system in which the learners are interacting. This interaction can help to distribute knowledge and reduce certain types of work, thus making the cognitive load less, thereby creating the potential for the development of new skills (Bell & Winn, 2000). As applied to my study, this theory holds that I would expect that students would demonstrate statistically significant improvement in academic achievement, attendance, and graduation rates as a result of being immersed in a 1:1 technology-rich learning environment.

History

Throughout the history of education, there have been numerous changes in the technologies used in our classrooms with the perceived intention of improving instructional practices and learning (Cuban, 2009). Many of these technologies have been in the form of different instructional strategies but not necessarily in the way of digital devices. These technologies, which range from slate boards to interactive whiteboards, have changed the environments in which teachers conduct instruction and students learn. In his 1982 paper titled "Computers in Education", Psotka stated, "Only a few years ago, few of us would have dreamed of a computer in every school; yet that dream is almost a reality today, and we can begin dreaming of a computer in every student's pocket" (Psotka, 1982, p. 221).

Three short years later, in 1985, educational technology was transformed with the initiation of the Apple Classroom of Tomorrow (ACOT) research project. This collaboration between schools and Apple Computer, Inc. involved the saturation of computers in K-12 classrooms with a research focus on the effects that constant access to computers had on both students and teachers. The design of the ACOT study did not replace existing instructional practices but supplemented and supported the instructional practices that were already occurring in each classroom where Apple researched from 1986 to 1989 (Dwyer, Ringstaff, & Sandholtz, 1994). In 1989, Ladies' Methodist College in Australia initiated the first 1:1 technology program only seven years after Psotka professed his dream of individualized computer devices for all students (Bebell, 2005).

Early National 1:1 Implementations

There have been several large-scale implementations of 1:1 computer technology around the world since the original application in Australia in 1989 (Sincar, 2013). In America, one of the largest and oldest initiatives occurred in the state of Maine. Beginning in 2001, the State of Maine implemented a comprehensive statewide 1:1 initiative (Sincar, 2013). Similarly, in 2002, the State of Iowa commisioned a ubiquitous technology program in all of the middle schools across the state (Saures & McLeod, 2012). Other early adopters of 1:1 technology include Massachusetts (Bebell & Kay, 2010) and Texas (Shapley et al., 2006).

1:1 Implementations in Indiana

While not widely recognized, Indiana has been on the leading edge of educational technology implementation. Beginning in 1988, the state, then led by Superintendent of Public Instruction H. Dean Evans, launched the *Buddy Project* (Lemke & Martin, 2004). This initiative placed computers in the homes and schools of several fourth, fifth, and sixth-grade students in select schools. While evaluations of the *Buddy Project* determined that students and their families improved their technology skills, evaluation results on the impact that the *Buddy Project* had on learning were mixed. The original *Buddy Project* lasted from 1988 until 2000 and involved approximately 9,000 families. Following the conclusion of the initial *Buddy Project*, the state initiated a second program known as *Buddy²* (Lemke & Martin, 2004). The purpose of the second program was focused on improving student academic performance, primarily writing skills. The *Buddy²* program shifted the focus away from the type of technology that was being used to focus more on the effective uses of technology to augment classroom instruction. To address the needs of secondary students, Indiana launched the Indiana Department of

Education's High School Literacy Through One-to-One Computing project in three high schools beginning in 2003 (Lemke & Martin, 2004).

Indiana has been unique from the rest of the country in its approach to implementing ubiquitous technology. Most programs found around the country focused in the early 2000's on the use of mobile laptop devices. Indiana chose to implement their original plans by supplying desktop computers to families at school and home. This approach was primarily a financial decision based on the fears of many state officials that were afraid that mobile computing would be too expensive to sustain (Lemke & Martin, 2004).

Interestingly, two of the first districts to implement 1:1 environments were different in almost every way. In 1997, Crawfordsville Community Schools, a relatively small rural school corporation in central Indiana (Indiana Department of Education Compass) implemented a 1:1 program with the goal of giving middle school students equal access to various technology tools available at that time. Quickly following suit, Indianapolis Public Schools, the largest school district in Indiana (Indiana Department of Education Compass), implemented a 1:1 technology program for many of the same reasons as Crawfordsville. In 1999, the two school districts combined efforts and applied for a five year, 9.8 million dollars federal grant focused on innovative technology integration. The grant was awarded and as a result, the districts developed the *Tech-Know-Build Project*. This project focused on problem-based learning. A vital element of the *Tech-Know-Build Project* was that it was one of the first projects of its kind that incorporated substantial and comprehensive professional development for both administrators and teachers alike (Lemke & Martin, 2004).

As technologies have improved and become more affordable, many school districts in Indiana have moved in the direction of implementing mobile 1:1 learning environments. The Indiana Department of Education Elearning website (www.doe.in.gov/elearning) contains data related to the number of districts or individual schools that have implemented 1:1 programs. This self-reported data indicated that in 2016, 145 school districts or individual schools had implemented some form ubiquitous technology initiative. It is also apparent that a large variety of device types and brands, grade levels, school configurations, and school population demographics were represented in the data (Indiana Department of Education Elearning). As a result, the available data for Indiana are very similar to other datasets found around the country in that it is challenging to compare the implementation and outcomes from one initiative to another because essentially no two implementations are the same (Bebell & O'Dywer, 2010).

Contemporary Politics

Since the inception of formal schools, someone or some group has been there to offer suggestions on how to make schools better. A variety of motivations has guided these school reformers. In some instances, the motivation to reform has been conducted using reasons that are perceived to be for the common good. In other cases, the motivation to change has been merely for political or personal gain (Cuban, 2009). The motivation to incorporate ubiquitous technology into our schools over the past decade has been perceived as being useful for our students, but has also been strongly influenced by, and has been a result of, contemporary politics. This section will focus on the impacts that modern politics has had on the widespread integration of technology into schools.

National Politics

Similar to most politically driven modern school reform initiatives, widespread technology integration can be traced back to 1983 publication of *A Nation at Risk* by the National Commission on Excellence in Education (Cuban, 2009). While this may not be the absolute starting point for the ubiquitous technology movement, it marked the first time that it had become part of the national conversation regarding education. The report was originally commissioned by President Regan to eliminate the United States Department of Education (Mehta, 2013). Contrary to the original purpose of the report, *A Nation at Risk* made public education a fertile political battleground focused not only on improving our education system but more importantly, doing so to keep our economic edge on the rest of the world (Cuban, 2009). To sustain this financial advantage, one of the many suggestions in the report focused on improving the technology that was available in America's schools. As a result, technology in education became a political issue and each President since Reagan has made a priority of trying to increase the technology in our classrooms at all levels of education (Cuban, 2009).

President Clinton was very engaged in the expansion of educational technology. This is best illustrated by his final comments at the 1996 National Education Summit held at the corporate headquarters of IBM where he spoke to governors, corporate leaders, federal officials, and a few educators. President Clinton said, "Technology if applied thoughtfully and well-integrated into our curriculum, we are convinced is a helpful tool to assist student learning, provide access to valuable information, and ensure a competitive edge for our workforce" (Cuban, 2009, p. 16)

Following his speech in 1996, President Clinton authorized for two billion dollars to be available in five-year grants from the Technology Literacy Fund. He also laid out four goals for the nation's schools to achieve. Those goals were: 1. Modern computers and learning devices accessible to every student. 2. Classrooms connected to one another and the outside world. 3. Educational software as engaging as the best video game as an integral part of the curriculum and. 4. Teachers ready to use and teach with technology (Cuban, 2009). Looking back on his four goals, it seems apparent that President Clinton may have had a vision for 1:1 technology in our nation's schools.

E-Rate

Also occurring in 1996 was the advent of what is known commonly as E-Rate. Officially, E-Rate is the Universal Service Fund for Schools and Libraries. This federal legislation is part of the Telecommunications Act of 1996 (Puma, Chaplin, & Pape, 2000). This program was proposed by both President Clinton and Vice President Gore and authorized by Congress to discount the cost of wiring classrooms to the Internet in schools with high percentages of low-income students (Cuban, 2009). E-Rate services ranged from discounting basic local and long-distance phone and Internet access services, including the acquisition and installation of equipment, to providing network wiring within school and library buildings. Discounts initially ranged from twenty to ninety percent depending on the economic need of the district or its rural location (Puma, Chaplin, & Pape, 2000).

By discounting the cost of the technology, both President Clinton and Congress believed that more students, particularly in poor rural locations, would receive better access to technology. They also understood that new technology is expensive and can force school officials to make

difficult choices between investing in technology and investing in other things that could improve learning, such as professional staff development, smaller classes, and better curriculum (Puma, Chaplin, & Pape, 2000).

The discount program distributed four billion dollars to schools in the first two years with almost eighty-four percent of the money going to public schools (Puma, Chaplin, & Pape, 2000). The combination of E-Rate funds and similar reforms resulted in more computers in American classrooms. In 1981, the student-to-computer ratio in our schools was 125 to 1. Following the federal policy initiatives, that rate fell to 5 to 1 by 2000 (Cuban, 2009).

Regardless of the motivation or political reasons, there is little doubt that federal involvement and policy decisions have led to the increase of technology in our classrooms across the country. The implementation of ubiquitous technology may not have been able to occur at such a rapid pace without the support from our governmental leaders, including several Presidents and Congress. Their policies resulted in billions of dollars being directed toward increasing hardware and wiring in schools across the country.

Teacher Impacts on Outcomes

Although the focus of this study is primarily on student outcomes, it is necessary to investigate the impact that teachers have on the process of implementing 1:1 technology. As with all school reform initiatives, the teachers in our schools are on the front line of technology implementation. Bebell and Kay (2010) stated that it is "impossible to overstate the power of individual teachers in the success or failure of 1:1 computing," (p.47) because of how they "nearly always control how and when students access and use technology during the school day," (p.47). Similarly, Shapley et al. concluded that "teacher 'buy-in' for technology

immersion is critically important because the teachers primarily dictate students' school experiences with technology" (Shapley et al., p. 24, 2010). Research has indicated that the introduction of laptops may have the potential to cause significant and rapid shifts in the roles of teachers and students in classroom learning. Teachers have started to see themselves as partners in learning with students and have begun embracing a more "reciprocal" relationship with students (Fairman, 2004). The following section serves as a review of the current literature related to teacher impacts on student outcomes in relation to 1:1 technology implementation.

Teacher Attitudes and Perspectives

The attitude, perspective, and approach of the classroom teacher have a strong influence on the outcomes of any classroom activity (Blackwell, 2014). When teachers view team building in the classroom as a high priority and a requirement for student learning, both teachers and students have reported a more welcome and conducive climate for the integration of teaching with technology (Downes & Bishop, 2015). In many instances, teachers have had to step away from their position of content knowledge expert to become more of a facilitator of information.

Laptop usage in classrooms in Maine have allowed a more reciprocal relationship to develop in the school, where both students and teachers serve as learners and teachers at the same time. As a result, both teachers and students benefited from the implementation (Fairman, 2004).

Instructional Practice

Teachers often replicate the pedagogy used when they were students into their instruction. This practice is being challenged since they are expected to use tools and techniques that did not exist when they were in school (Broussard, Hebert, Welch, & VanMetre, 2014). Several studies

have found patterns demonstrating a considerable number of changes in teachers' teaching styles related to an increase in technology available in the classroom (Shapley et al., 2010; Bell & Kay, 2010; Drayton et al., 2010; Storz & Hoffman, 2013; Suhr et al., 2010). Both students and teachers have reported less whole-class, lecture-format instruction and more small-group and individualized instruction. Both students and teachers have also described examples of increased hands-on, interactive instruction (Storz & Hoffman, 2013).

In multiple studies, the most frequent use of technology by teachers and students has been the use of laptops to conduct online research. Also, the use of productivity tools such as word processors and presentation software has frequently appeared in multiple studies (Drayton, et al., 2010; Dunleavy, Dexter, & Heinecke, 2007; Storz & Hoffman, 2013; Warschauer & Grimes, 2005). Writing and revising school papers was one of the most common uses of laptops in a survey conducted in California in 2005. In that study, ninety-eight percent of students indicated that they had used their laptops to write papers at school, with fifty-nine percent responding that they did so several times a week or more, and eighty-five percent reporting the use of laptops to write papers while at home (Warschauer & Grimes, 2005).

Several studies have been conducted to examine the teacher behaviors needed for the successful technology implementation into the classroom. The majority of the studies have focused on teacher attitudes and perspectives, professional development, and instructional practices. In summation of those studies, researchers have concluded: First, a teacher's opinion and outlook on technology in education have a significant impact on a successful integration (Blackwell, 2014). Secondly, the majority of teachers in our schools were never formally trained to teach in a technology-rich environment. As a result, quality professional development in

conjunction with time to develop and practice new skills is a vital ingredient for any new education initiative, including technology integration (Sugar, 2014).

Professional Development

It is important to remember that formal training for teaching in a technology-rich environment has not yet occurred for the majority of the teachers that are currently in our schools (Burns-Sardone, 2014). Studies have indicated that as policymakers and school leaders initiate 1:1 programs, they need to consider the scope and complexity of the undertaking for teachers and students (Downes & Bishop, 2015). Opportunities to learn are needed to demonstrate to teachers what instruction and assessment practices, curricular resources, and classroom management skills work best in 1:1 settings to create productive learning environments (Dunleavy, Dexter, & Heinecke, 2007).

To prevent overwhelming teachers and undermining technology integrations, it has been suggested that districts focus all other school improvement initiatives to the challenges and opportunities of 21st-century teaching and learning (Downes & Bishop, 2015). It is equally important to incorporate faculty modeling to assist teachers in improving their proficiency in technology, pedagogy, and content knowledge as one unit and not as separate skill sets. The model of providing teachers with an on-staff instructional coach that can support them as they learn new skills and acquire new knowledge has often proven to be successful (Sugar, 2014).

Additionally, studies have indicated that participants in online professional development activities have demonstrated significant gains regarding knowledge, experience, and confidence in using technology in the classroom (Walker et al., 2011; Lawless & Pellegrino, 2007). When teacher candidates were given ubiquitous access to laptops with the expectation of purposeful

use, their positive beliefs about the educational use of technology and their skill levels significantly increased (Donovan, Green, & Hanson, 2011).

Koehler and Mishra (2006) warned that introducing teachers to instructional technology without a connection to a specific teaching and learning context would result in too much focus on tools and too little focus on using technology to support pedagogy. It is also imperative that "time and effort should be devoted to increase teachers' confidence for using technology, not just to accomplish administrative and communicative tasks, but to achieve student learning objectives," (Ertmer & Ottenbreit-Leftwich, 2010 p. 261).

Frameworks for Professional Practice

As a result of increased classroom technology integration, researchers have developed frameworks for teacher knowledge and professional practice. These frameworks move the focus onto how technology is being used in the classroom by teachers and students and away from focusing only on the implementation itself (Mishra & Koehler, 2006).

TPACK

One framework known as TPACK was developed by Punya Mishra and Matthew Koeler at Michigan State University. The acronym TPACK stands for technology, pedagogy, and content knowledge. This framework is a complex interaction between these three bodies of knowledge. The blending of these bodies of knowledge produces the types of flexible thinking needed to successfully integrate technology use into teaching (Koehler & Mishra, 2009). To prepare teachers for a technology-rich environment, professional development, including teacher training, should focus on building skills included in the TPACK framework (Schmidt et al., 2009). As a result of professional development and knowledge advancement within the TPACK

framework, teachers have proven to be better prepared to adjust their teaching practices to meet the opportunities that arise based upon the availability of technology in their classrooms (Broussard, Hebert, Welch, & VanMetre, 2014).

SAMR Model

A second framework known as the SAMR Model was developed in 2006 by Ruben R. Puentedura as part of his work with the Maine Learning Technologies Initiative (Puentedura, 2006). The acronym SAMR stands for substitution, augmentation, modification, and redefinition. This framework can be used to classify and evaluate the level of technology implementation and assist educators in creating optimal educational experiences. (Romrell, Kidder, & Wood, 2014).

On the framework, the substitution level describes a level of technology implementation that provides a substitute for other learning activities without functional change. The augmentation level provides a substitute for other learning activities but with functional improvements. The modification level describes a level of technology implementation that allows the learning activity to be redesigned. The redefinition level describes a level of technology implementation that allows for the creation of tasks that could not have been done without the use of the technology. Learning activities that fall within the substitution and augmentation levels are considered to enhance learning, while learning activities that fall within the modification and redefinition levels are considered to transform learning (Puentedura, 2013).

Student Outcomes

Since the initial implementations of ubiquitous instructional technologies, policy makers, educational leaders, and parents have questioned the impacts of these technologies on student outcomes including academic achievement, student engagement, student behavior, and

technology literacy. The following section serves as a comprehensive review of the literature related to student outcomes.

Academic Achievement

The primary goal of any educational institution is to increase the academic performance of its students. Numerous research studies have been conducted that focus on investigating the impact of 1:1 technology implementations on student academic achievement. This body of research has documented several instances of positive student improvements in core academic areas, particularly in writing skills. In their study, Silvernail & Gritter (2007) found that students in Maine, where 1:1 technology has been present in all middle schools since 2002, indicated significant gains in writing on their statewide standardized test. When looking at student performance on the eighth-grade standardized writing assessment between 2000 and 2005, the average scale score increased 3.44 points. Conversely, the students that reported that they did not use computers as part of their writing had the lowest scale score on the 2005 statewide assessment (Silvernail & Gritter, 2007). In a similar study, researchers divided students into two groups from the same grade at the same school. One of the groups was given laptop computers to use twenty-four hours a day and the other group was not. The students with the laptop computers displayed much better writing skills when compared to the other group (Lowther, Ross, & Morrison, 2003). Additionally, preliminary studies have indicated that twenty-four-hour access to laptop devices trumps in-school laptop learning regarding engagement of students in high-quality writing (Fadel & Lemke, 2006).

Other studies, such as Bebell & Kay (2010), have affirmed these findings of improved writing abilities as a result of ubiquitous technology exposure. In their 2010 study, they

determined that teachers believed that the quality of student work improved for all students, including at-risk students as well as high-performing students, after being exposed to technology.

In 2010, Suhr, Hernandez, Grimes, & Warschauer determined that two years of ubiquitous technology exposure increased not only writing skills but also the literacy skills of the fourth-grade students in their study. Their study specifically found that students in a laptop program outperformed their peers in literacy response and analysis, as well as writing strategies. The effect of ubiquitous technology exposure on the spelling skills of students with learning disabilities was the focus of a study conducted by Eden, Shamir, & Fershtman in 2011. In this study, researchers divide students that enrolled in the Israeli "Katom" (A Computer for Every Class, Student, and Teacher) program into two groups. One group of students was given laptop computers while the other group received traditional instruction. After analyzing the data, the study determined that the students exposed to 1:1 technology improved their spelling scores dramatically compared to the group that did not have laptops.

The research regarding further impacts of ubiquitous technology exposure on other subject areas is not as robust as the studies found in the areas of English/Language Arts. Recognizing this void in information, Dunleavy, Dexter, & Heinecke conducted a study in 2007 which focused on the achievement of middle school students using laptops in their science and math classes. The results of the study revealed that students demonstrated substantial improvement in their science scores, but virtually no increase in their math scores as a result of using the laptops (Dunleavy, Dexter, & Heinecke 2007).

In a similar study, Berry & Wintle used pre/post assessments to determine that students who used laptop computers in science demonstrated a much higher level of content

comprehension when compared to students in other classrooms that had completed a traditional science project. Additionally, when checked for retention, it was determined that the students exposed to ubiquitous technology had a much higher rate of retention compared to their peer group (Berry & Wintle, 2009).

In a study focused on academic achievement in English/ Language Arts, math, writing, and the grade point average of middle school students, Gulek & Demirtas (2005) concluded that there were no statistically significant differences in test scores and grade point averages between laptop and non-laptop students before implementation. After one year of involvement in a 1:1 laptop program, however, the students that had laptops demonstrated significantly higher achievement regarding nearly all measures, an effect that was documented over the three-year course of the longitudinal study.

In a similar study, Kposowa & Valdez (2013) concluded that the use of laptops by 4th and 5th grade students in California resulted in improved student performance in English Language/Arts, Mathematics, and Science. These findings contradicted previous studies that had indicated that laptops had no effect on student achievement.

Extensive multi-year research has been conducted to determine the impact of the ubiquitous technology implementation program in Texas on state standardized tests. As a result of those studies, it has been determined that students' access and use of technology was a consistent positive predictor of reading and math performance, with home use of laptop computers being the most reliable implementation predictor for academic achievement (Shapley et al., 2006, 2007, 2009, 2010).

Some available research has focused on overall student academic achievement, rather than focusing on specific subject areas or skills. As part of their study, Lei and Zhao (2008) compared the grade point average of 213 middle school students from the end of the year before laptop implementation to the end of the year after implementation. In a similar study, Gulek and Demerits (2005) studied the impacts of 1:1 laptop implementation and student achievement. Both studies concluded that student grade point averages increased after the implementation of the laptop program. It is worth noting, however, that Lei and Zhao also warned that students' academic performance could be a result of many factors occurring at that same time, not just the implementation of technology alone.

Student Engagement

As well as measuring the growth of student academic performance, several studies have investigated the impact of the implementation of ubiquitous technology on student engagement. Generally speaking, the research has indicated positive outcomes related to technology and student engagement. In Vermont, a study involving middle school students demonstrated that technology offered teachers an innovative means for students to explore group and individual identity, come to know each other, and learn to work together (Downes & Bishop, 2015). In Texas, researchers examined the connection between student engagement and 1:1 computing initiatives. Researchers evenly divided forty-four middle schools into two groups for the study. One group of schools distributed laptops to their students and the other team employed a more traditional approach. Research indicated that the students in the schools that had laptops expressed a statistically significant higher level of classroom satisfaction compared to the students that did not have laptops (Shapley et al., 2006, 2007, 2009, 2010). Researchers

observed student satisfaction in other studies where technology offered relevant and accessible avenues for otherwise marginalized students to find their voices and places in the classroom (Downes & Bishop, 2015).

A variety of studies across the country, using various implementation strategies, have reported an increase in student engagement. In Massachusetts, teacher and student surveys, teacher and principal interviews, and classroom observations were used by researchers to conclude that student engagement had, in fact, increased. Of the teachers that responded, eighty-three percent believed that the students were more engaged, and seventy-one percent indicated that they felt that the students were more motivated after the implementation of the laptops into their classrooms (Bebell & Kay, 2010). In Florida, researchers conducted a large-scale study involving forty-seven K-12 schools across eleven school districts. They concluded that in the classrooms where laptops were present, there was a significant increase in student attention, interest, and engagement. This increase in participation is not only limited to laptop computers, but it has also been found with the use of tablet computers as well (Amelink, 2012).

Researchers have observed a decrease in the use of traditional classroom activities and an increase in project-based learning in other studies (Dawson, Cavanaugh, Ritzhaupt, 2008; Cavanaugh, Dawson, & Ritzhaupt, 2011). Suhr et al. found a "high level of student engagement in the "laptop classroom" and teachers specifically reported that "students enjoyed using multimedia, searching the internet, and writing their papers on the computer," (Suhr et al., p. 24, 2010). Similarly, Hur and Oh's 2012 research in a South Korean middle school indicated greater student engagement, however, did not indicate a significant difference in test scores between groups that had laptops and those that did not.

Many educators believe that the implementation of ubiquitous technology will result in disruptions, distractions, and an increase in the number of student disciplinary incidents. The existing research seems to indicate that the opposite may occur, and that student engagement may be one of the most significant benefits of technology integration into the classroom. As with all areas of this relatively new school initiative, additional current research is a needed.

Student Behavior and Attendance

Researchers have conducted substantial research on the impacts of 1:1 technology implementation on student academic achievement and student engagement in their learning. In addition to these outcomes, there may be additional benefits to implementing technology into the classroom, such as positive changes in student behavior and attendance.

In multiple studies, it has been concluded that the implementation of technology in the classroom has had a positive impact on student attendance and student behaviors (Downes & Bishop, 2015; Lane, 2003; Shapley et al., 2009; Storz & Hoffman, 2013; Warschauer & Grimes, 2005). Lane (2003) reported that with the implementation of laptops in classrooms in Maine, not only did student engagement increase but that student attendance rates increased as well. Additionally, it has been documented that students with laptops at their disposal were sent to the office less frequently and were suspended from school at a lower rate compared to students that were not supplied with laptops (Shapley et al., 2006).

Student and teacher observations in a different study indicated that the addition of laptops in the classroom had both positive and negative effects (Swallow, 2015). Some students suggested that the use of laptops had made the behavior of individual students worse and that some students were often off-task, playing games, and using social media instead of being

engaged in their classroom activities. Researchers affirmed this perception in another study where teachers reported that classroom management had become much more difficult with the addition of computers into the classroom (Donovan, Green, & Hartley, 2011).

Multiple studies have further indicated that the implementation of new technology in classrooms with teachers who have poor classroom management skills to begin with, resulted in those teachers having a much harder time controlling their classes (Dunleavy, Dexter, & Heinecke, 2007). This finding was not necessarily a result of technology usage, however, but may be more an example of how technology can magnify poor practices.

In contrast to the perceptions of negative behavior consequences, a third study revealed that both teachers and students reported improved student behavior overall. The authors of that study described students as being less disruptive and the classroom being much more orderly and quieter after the implementation of laptops (Storz & Hoffman, 2013). It is possible this outcome may be more a result of quality classroom management in conjunction with technology usage, as opposed to being solely the result of the introduction of technology into the classroom.

Student Behavior and Time of Exposure

Research suggests that the length of exposure that students have had to technology in the classroom may impact their behaviors and technology usage habits as well (Donovan, Green, & Hartley, 2010; Hur & Oh, 2012; Tallvid, 2015). For instance, as time progressed, students in Sweden used their laptops for more appropriate educational uses and fewer instances of inappropriate usage (Tallvid, 2015). However, contradictory evidence suggests that as the novelty of the technology in the classroom wears off, student engagement decreases and the inappropriate usage of laptops begins to increase (Hur & Oh, 2012). Additionally, further

studies have demonstrated evidence that increased use of laptops has not resulted in increased student engagement and has led to a range of undesirable off task-behaviors (Donovan, Green, & Hartley, 2011).

As with all data related to technology implementations, it is difficult to draw definite conclusions because almost all applications are complicated, different in scope, and guided by different institutional visions and goals (Storz & Hoffman, 2013). Further research in the area of additional benefits, such as student attendance and behavior, is still needed.

Socio-economic Status and 1:1 Technology

One goal for implementing 1:1 technology into the classroom is to reduce educational and societal inequity. Ubiquitous technology programs may help lessen the digital divide by providing access to technology to students who do not have resources to acquire it themselves (Pittaluga & Rivoir, 2012). Several studies have been conducted to determine if 1:1 technology helps to alleviate inequities in outcomes for students with low socio-economic status. These studies suggest that in comparison with high socio-economic students, low socio-economic students gain more technological skills from 1:1 technology environments because they started with less experience working with computers (McKeeman, 2008). As an example, economically disadvantaged students in 1:1 technology schools reached the same technological skills as high socio-economic students after three years of participation in a 1:1 program (Shapley et al., 2011).

The academic impact that 1:1 technology has on student outcomes for low socio-economic students is not clear. Several studies have identified positive impacts on academic achievement for financially disadvantaged students. One study determined that immersion in a 1:1 technology program had resulted in the achievement gap on standardized English/Language

Arts assessments being reduced between low socio-economic students and their peers (Kay, 2010). Further support that 1:1 technology has a positive impact on low socio-economic student academic performance is provided by Zheng et al.'s (2013) study of elementary school 1:1 programs in Colorado and California. Their study found that low-income and Hispanic students in each district improved their writing test scores more than their more affluent classmates (Zheng et al., 2013).

These positive results have not been achieved in all 1:1 technology programs. Bebell & Kay (2010) found that eighth-grade students who reported greater frequency of using their computers for recreation at home had higher English/Language Arts achievement, but when controlled for student socio-economic status the positive effect diminished greatly. Several studies have suggested that disadvantaged students typically face more difficulty in using technology, due to having less prior experience or technology skills. This adds an extra obstacle for already academically challenged students (Warshauer, 2008; Zuber & Anderson, 2013). In addition, teachers and students from advantaged schools are usually more technologically savvy, allowing them to focus on teaching and learning opportunities that maximize the educational benefits of the 1:1 technology instead of focusing on basic technology skills (Rousseau, 2007).

Student Outcome Conclusions

Numerous studies have been conducted over many years to investigate the outcomes that have resulted from the widespread integration of technology into schools. The majority of the studies have focused on the student outcomes of academic achievement, engagement, student behavior, and student attendance rates. In summation of those studies, the following can be concluded: First, in some cases, the implementation of technology has resulted in marginal

student academic gains with the most substantial increases coming in the area of writing. Specifically gains in literary response and analysis were observed along with an impovement in student writing strategies (Suhr, Hernandez, Grimes, & Warschauer 2010). Secondly, in some cases, the implementation of technology has increased student engagement (Bebell & Kay, 2010), while in other cases the application of technology has resulted in decreased student engagement (Hur & Oh, 2012). Thirdly, in some cases, the use of technology improved student behavior (Downes & Bishop, 2015), while in other instances student behavior has declined after the technology was implemented (Donovan, Green, & Hartley, 2011). Finally, student attendance improved after the implementation of technology (Lane, 2003). Also, studies have indicated that student socio-economic status may have an impact on how successful 1:1 technology implementations are in improving student academic outcomes (Warshauer, 2008; Zuber & Anderson, 2013). While positive impacts on student discipline and attendance rates are substantiated, student performance on standardized tests has not consistently demonstrated the same positive results. Silvernail (2005) believes that one explanation for this is that the skills promoted in laptop programs such as critical thinking, research skills, and in-depth analysis are not evaluated by the kind of questions found on most standardized tests.

Summary

To examine the impact of one-to-one initiatives on teaching and learning, we first need to understand how the teacher uses the technology and how that usage plays a role in teaching and learning in a complex social context (Dunleavy, Dexter, & Heinecke, 2007). To accomplish this, we must look at teacher perceptions, teacher knowledge and skill levels, and instructional practices. Second, it is essential to examine all of the student outcomes, both positive and

negative, that may have resulted from the implementation of technology-rich learning environments. Despite variations and outcomes between and across 1:1 settings, participation in 1:1 programs have increased student and teacher technology use, increased student engagement and attendance rate and has often resulted in modest increases in student achievement primarily in writing skills (Downes & Bishop, 2015). Outcomes, both positive and negative, are not solely dependent on the level of student access to technology. The level of student and teacher use and the quality level of implementation as determined by leadership, teacher proficiency, professional development, fit with curriculum, school culture, and pedagogical approaches also has an impact on outcomes (Fadel & Lemke, 2006).

Since 1:1 technology implementation only describes the ratio of available technology for each student, it has proven very difficult to draw far-reaching and meaningful conclusions about student outcomes, including academic achievement, student attendance, and graduation rates. Other variables that may exist, such as teaching methods and implementation, must be taken into account when studying 1:1 implementations (Downes & Bishop, 2015).

CHAPTER THREE: RESEARCH METHODS

According to Creswell (2014), quantitative research is an approach to exploring and understanding a problem by collecting and analyzing data to draw conclusions. This study used traditional descriptive statistics as well as inferential statistics to draw conclusions related to 1:1 technology implementations and student outcomes.

Previous research into the effects of 1:1 technology implementations have provided mixed results in student academic performance, but generally positive results in student engagement, discipline, and attendance (Amelink, 2012; Bebell & Kay, 2010; Berry & Wintle, 2009; Cavanaugh, Dawson, & Ritzhaupt, 2011; Donovan, Green, & Hartley, 2011; Downes & Bishop, 2015; Dunleavy, Dexter, & Heinecke, 2007; Fadel & Lemke, 2006; Grimes, & Warschauer, 2010; Gulek & Demirtas, 2005; Hur & Oh's 2012; Kposowa & Valdez, 2013; Lane, 2003; Lei and Zhao, 2008; Lowther, Ross, & Morrison, 2003; Shamir, & Fershtman, 2011; Shapley, et al., 2006, 2007, 2009, 2010; Silvernail & Gritter, 2007; Storz & Hoffman, 2013; Suhr, Hernandez, Eden, Dawson, Cavanaugh, Ritzhaupt, 2008; Suhr et al., p. 24, 2010; Swallow, 2015; Tallvid, 2015; Warschauer & Grimes, 2005). This study collected and analyzed archival student data from public high schools in Indiana to investigate the outcomes that may have resulted from 1:1 technology implementation. This will provide stakeholders with current research on which they may base decisions on future school technology implementations.

Chapter Three describes the research methodology used for this study. This chapter contains a review of the purpose of this research along with the questions that guided it. Following this information is a detailed description of the quasi-experimental research design

selected and an explanation of the archival data sources that were used. A detailed description of the different samples that were used to answer each research question is provided to clarify the study further. Finally, a discussion of the data collection methods along with a description of the data analysis techniques that were used to draw conclusions are provided. To conclude this chapter is a brief description of the limitations of the study.

Purpose of Study

The purpose of this study was to identify, analyze, and compare differences in student outcomes between public high schools in Indiana that had implemented 1:1 technology learning environments with those that had not. This study utilized archival student outcome data from the majority of public high schools in Indiana. Stakeholders for this study included students, parents, faculty and staff, and policymakers that connected to schools that have implemented a 1:1 technology learning environment or considering a 1:1 technology learning environment, as well as those that have decided against implementing 1:1 technology. For this study, the independent variable was the implementation of a 1:1 technology learning environment. The dependent variables consisted of several traditional school performance metrics including student performance on two different standardized tests in English/Language Arts as well as student attendance and student graduation rates.

Research Questions

The research questions that guided this study were:

1. What is the difference in student academic performance between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?

2. What is the difference in student attendance rates between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?
3. What is the difference in student graduation rates between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?

Research Design

A quasi-experimental design was used to collect archival data related to public high schools and student outcomes. This type of design does not utilize a random sampling of the population but rather an intentionally selected sample to draw conclusions (Creswell, 2014). Archival student performance data from a sample of 375 public high schools in Indiana were collected and compared statistically to determine the differences in student outcomes in academic achievement, attendance rates, and graduation rates between schools that have implemented 1:1 technology and those that have not. The following sections in this chapter provide a more detailed explanation of the research methodology used for this study.

Identification of Schools

To identify and select the high schools in Indiana that had implemented 1:1 technology, the 2016 Indiana Technology Plan Survey was used. The Indiana Technology Plan Survey is an annual survey conducted in March by the Indiana Department of Education Office of eLearning. (IDOE). The purpose of the survey is to collect data from all Indiana schools regarding their progress toward integrating technology into their classrooms. Annually, each school corporation in Indiana is asked to complete the survey by answering questions related to their district's

implementation of technology. The school technology leaders from each school district are responsible for completing this survey by self-reporting on the status of various technology related topics each spring. This submission of data serves as a requirement to qualify for several funding sources such as the common school fund, the connectivity grant, and grants from the Office of eLearning (IDOE). The Indiana Department of Education made the data from the survey public in April 2016.

Not all private schools in Indiana are required to participate in state standardized student achievement testing or student data reporting. As a result, this study only used data from public high schools for comparison. Also, there are numerous variations of 1:1 technology implementations across the high schools in Indiana. For this study, only schools that had provided 1:1 devices to their students were considered to be 1:1 technology schools. Schools that allowed students to bring their own devices (BYOD) were not considered to be 1:1 schools.

Although the results of each year's survey are made public, they are published in a coded format to prevent individual school district responses from being easily identifiable. A request for the unprocessed data was made to the Indiana Department Office of eLearning to identify individual schools. As a result of the request, Dr. Jason Bailey, Senior eLearning Strategist, released the unprocessed data file once an agreement of confidentially had been reached (Appendix C). To comply with this agreement, survey responses for individual schools and corporations are not identifiable in this study.

The identification of individual schools and corporations is not relevant to the purpose of this study or necessary to draw conclusions guided by the research questions. Data gleaned from the survey were used to identify and classify schools that had implemented 1:1 technology and

those that have not. The schools that had self-reported having 1:1 technology were then further sorted based on being a public or private school. The sorting process identified that student outcomes for 375 of the 404 public high schools could be compared. Further analysis revealed that 236 of the 375 public high schools had reported a 1:1 technology implementation in 2016.

Table: 1. Total 1:1 Technology Implementations (2015-16)

Schools with 1:1 Implementation	N	Percent
Yes	232	61.9
No	143	38.1
Total	375	100

(2016 Indiana Technology Plan Survey)

Description of the Sample

Not all of the public high schools in Indiana completed the Indiana Technology Plan Survey, participated in the standardized testing selected for this study, or may not have reported attendance and graduation rate data for 2016. As a result, different sample groups were compared statistically to draw conclusions for each of the research questions.

Data from a sample of 375 public high schools in Indiana were used to determine the differences in student outcomes between schools that had 1:1 technology implementations and those that did not. The public high schools that were compared had a total combined enrollment of 298,581 students in grades 9-12 during the 2015-16 school year. The students enrolled represented several ethnicities and income levels as well as different learning abilities and level of mastery of the English Language. The following sections provide a detailed description of the students enrolled in the sample schools used for this research.

Ethnicity

According to the Indiana Department of Education, the students enrolled in the sample

public high schools represent several different ethnicities. The largest ethnic group consisted of white/Caucasian students totaling 215,952, approximately seventy-two percent of all students enrolled in the sample schools during the 2015-16 school year. The second largest group were black students totaling 34,704, nearly twelve percent of the students in the sample schools. Hispanic students made up about ten percent of the enrollment with 28,754 students. The final six percent of students were identified as Multiracial, Asian, American Indian, and Native Hawaiian/Pacific Islander, totaling 19,171 students.

Table 2. Student Ethnicity**:** Total Sample of High Schools (2015-16)

Ethnicity	Number of Students	Percentage
American Indian	784	.26
Asian	6,223	2.08
Black	34,704	11.6
Hispanic	28,754	9.63
Multiracial	11,982	4.01
Native Hawaiian/Pacific Islander	182	.06
White	215,952	72.3

(Indiana Department of Education)

The two hundred thirty-two public high schools that had implemented 1:1 technology had a total enrollment of 173,918 students comprised of several different ethnicities. The largest group consisted of white/Caucasian students totaling 131,477, approximately seventy-six percent of all students enrolled in sample 1:1 schools during the 2015-16 school year. The second largest group were black students totaling 17,119, roughly ten percent of the students enrolled in 1:1 schools. Hispanic students made up about nine percent of the enrollment with 15,253

students. The final eight percent of students were identified as Multiracial, Asian, American Indian, and Native Hawaiian/Pacific Islander, totaling 10,069 students.

Table 3. Student Ethnicity: High Schools With 1:1 Technology (2015-16)

Ethnicity	Number of Students	Percentage
American Indian	438	.25
Asian	3111	1.79
Black	17,119	9.84
Hispanic	15,253	8.77
Multiracial	6,418	3.69
Native Hawaiian/Pacific Islander	102	.06
White	131,477	75.6

(Indiana Department of Education)

The one hundred forty-three sample public high schools that had not implemented 1:1 technology had a total enrollment of 124,663 students also comprised of several different ethnicities. The largest ethnic group consisted of white/Caucasian students totaling 84,646, approximately sixty-eight percent of all students enrolled in the sample schools during the 2015-16 school year. The second largest group were black students totaling 17,636, roughly fourteen percent of the students enrolled in the schools without 1:1 technology. Hispanic students made up about eleven percent of the enrollment with 13,532 students. The final seven percent of students were identified as multiracial, Asian, American Indian, and Native Hawaiian/Pacific Islander, totaling 9,124 students.

Table 4. Student Ethnicity: High Schools Without 1:1 Technology (2015-16)

Ethnicity	Number of Students	Percentage
American Indian	346	.28
Asian	3,112	2.5
Black	17,585	14.1
Hispanic	13,501	10.8
Multiracial	5,564	4.46
Native Hawaiian/Pacific Islander	80	.06
White	84,475	67.8

(Indiana Department of Education)

Free/Reduced Status

The students enrolled in the sample public high schools represented a wide range of social-economic levels. According to the Indiana Department of Education, approximately fifty-eight percent of the students did not qualify for a reduced price or free lunch. This group consisted of 174,283 students. Roughly thirty-four percent of the students, 101,723, did qualify for free lunch. The smallest group identified were those that qualified for a reduced lunch price. Those students made up about seven and a half percent of the students, totaling 22,575.

Table 5. Free/Reduced Lunch Status: Total Sample of High Schools (2015-16)

Lunch Status	Number of Students	Percentage
Paid Lunch	174,283	58.4
Reduced Lunch	22,575	7.56
Free Lunch	101,723	34

(Indiana Department of Education)

The students enrolled in the sample public high schools that had implemented 1:1 technology represented a wide range of social-economic levels. According to the Indiana Department of Education, approximately fifty-nine percent of the students did not qualify for a reduced price or free lunch. This group consisted of 102,527 students. Nearly thirty-three percent of the students, 58,005, did qualify for free lunch. The smallest group identified were those that qualified for a reduced lunch price. Those students made up about eight percent of the students, totaling 13,386.

Table 6. Free/Reduced Status: High Schools With 1:1 Technology (2015-16)

Lunch Status	Number of Students	Percentage
Paid Lunch	102,527	59
Reduced Lunch	13,386	7.7
Free Lunch	58,005	33.6

(Indiana Department of Education)

The students enrolled in the sample public high schools that had not implemented 1:1 technology also represented a wide range of social-economic levels. According to the Indiana Department of Education, approximately fifty-eight percent of the students did not qualify for a reduced price or free lunch. This group consisted of 71,756 students. About thirty-five percent of the students, 43,718, did qualify for free lunch. The smallest group identified were those that qualified for a reduced lunch price. Those students made up about seven percent of the students, totaling 9,189.

Table 7. Free/Reduced Status: High Schools Without 1:1 Technology (2015-16)

Lunch Status	Number of Students	Percentage
Paid Lunch	71,756	57.6
Reduced Lunch	9,189	7.37
Free Lunch	43,718	35.1

(Indiana Department of Education)

Special Education

The students enrolled in sample public high schools can be divided into two groups based on their education status. According to the Indiana Department of Education, approximately eighty-six percent of the students in the sample schools were general education students, meaning they did not have an individual education program (IEP). The total number of general education student enrolled in the sample schools totaled 257,426 in 2015-16. The remaining fourteen percent of the students enrolled in the sample schools, totaling 41,155, were identified as receiving special education services.

Table 8. Special Education Status: Total Sample of High Schools (2015-16)

Special Education Status	Number of Students	Percentage
General Education	257,426	86.2
Special Education	41,155	13.8

(Indiana Department of Education)

The students enrolled in sample public high schools that had implemented 1:1 technology can be separated into two groups based on their education status. According to the Indiana Department of Education, approximately eighty-six percent of the students in the sample schools that had implemented 1:1 technology were general education students, meaning they did not

have an individual education program (IEP). The total number of general education student enrolled in the sample schools that had implemented 1:1 technology totaled 149,795 in 2015-16. The remaining fourteen percent of the students enrolled in the sample schools that had applied 1:1 technology totaling 24,123, were identified as receiving special education services.

Table 9. Special Education Status: High School With 1:1 Technology (2015-16)

Special Education Status	Number of Students	Percentage
General Education	149,795	86.1
Special Education	24,123	13.9

(Indiana Department of Education)

The students enrolled in sample public high schools that had not implemented 1:1 technology can be separated into two groups according to their education status. According to the Indiana Department of Education, approximately eighty-six percent of the students in the sample schools that had not implemented 1:1 technology were general education students, meaning they did not have an individual education program (IEP). The total number of general education student enrolled in the sample schools totaled 107,631 in 2015-16. The remaining fourteen percent of the students enrolled in the sample schools that had not implemented 1:1 technology, totaling 17,032, were identified as receiving special education services.

Table 10. Special Education Status: High School Without 1:1 Technology (2015-16**)**

Special Education Status	Number of Students	Percentage
General Education	107,631	86.3
Special Education	17,032	13.7

(Indiana Department of Education)

English Language Learners

Students in the sample public high schools can be separated into two groups according to their mastery of the English language. According to the Indiana Department of Education, approximately ninety-seven percent of the students enrolled in the sample public high schools were fluent in the English Language. This group of non-English learners consisted of 290,085 students in 2015-16. The remaining three percent of students enrolled in the sample public high schools were English Language Learners. This group of English language learners consisted of 8,496 students in 2015-16.

Table 11. English Language Status: Total Sample of High Schools (2015-16)

English Language Status	Number of Students	Percentage
Non-English Language Learner	290,085	97.2
English Language Learner	8496	2.85

(Indiana Department of Education)

Students in the sample public high schools that had implemented 1:1 technology can be separated into two groups according to their mastery of the English language. According to the Indiana Department of Education, approximately ninety-seven percent of the students enrolled in the sample public high schools that had implemented 1:1 technology were fluent in the English Language. This group of non-English learners consisted of 169,316 students in 2015-16. The remaining three percent of students enrolled in the sample public high schools that had implemented 1:1 technology were English Language Learners. This group of English language learners consisted of 4,602 students in 2015-16.

Table 12. English Language Status: High Schools With 1:1 Technology (2015-16)

English Language Status	Number of Students	Percentage
Non-English Language Learner	169,316	97.4
English Language Learner	4,602	2.65

(Indiana Department of Education)

Students in the sample public high schools that had not implemented 1:1 technology can be separated into two groups according to their mastery of the English language. According to the Indiana Department of Education, approximately ninety-seven percent of the students enrolled in the sample public high schools that had not implemented 1:1 technology were fluent in the English Language. This group of non-English learners consisted of 120,769 students in 2015-16. The remaining three percent of students enrolled in the sample public high schools that had not implemented 1:1 technology were English Language Learners. This group of English language learners consisted of 3,894 students in 2015-16.

Table 13. English Language Status: High Schools Without 1:1 Technology (2015-16)

English Language Status	Number of Students	Percentage
Non-English Language Learner	120,769	96.9
English Language Learner	3,894	3.12

(Indiana Department of Education)

Student Outcomes Data Sources

Archival data for student outcomes in the areas of academic performance, attendance, and student graduation rates were collected from the Indiana Department of Education. Academic achievement data for the 2016 Indiana ISTEP+ English/Language Arts End-of-Course Assessment and the 2016 Indiana ISTEP+ 10 English/Language Arts Assessment had to be

collected through a public records request. Attendance and graduation rate data collected for the 2015-16 school year came from data publicly available from the Indiana Department of Education.

Student Academic Performance Data Sources

The following section describes in detail the sources selected to collect student academic performance data for the public schools for this study. The 2016 ISTEP+ English/Language Arts End-of-Course Assessment and the 2016 ISTEP+ 10 English/Language Arts Assessment were chosen to compare the student academic performance between schools with 1:1 technology and those without 1:1 technology. These two standardized assessments were selected because all students that are on track to graduate from high school in Indiana must take them by the end of their tenth-grade year (IDOE). The selection of these two assessments resulted in a large number of participants from across the state.

ISTEP+ English/Language Arts End-of-Course Assessment and ISTEP+ 10 English/Language Arts Assessment. The overall purpose of the Indiana Statewide Testing for Educational Progress-Plus (ISTEP+) program is to measure student achievement in the subject areas of English/Language Arts, mathematics, science, and social studies. The ISTEP+ assessment is criterion-referenced and is designed to measure students' mastery of the Indiana College and Career Readiness Academic Standards. The ISTEP testing program was first administered in 1988 to students in grades 1-3 and grades 6-9. The grades tested and the tests themselves have changed several times since the inception of the test. The current testing configuration was implemented in 2009 and includes the testing of all students in grades 3-8 and those students that have completed Algebra I and English 10. Starting in the spring of 2016, the

ISTEP+ 10 English/Language Arts Assessment was introduced as a replacement for the ISTEP+ English/Language Arts End-of-Course Assessment and the ISTEP+ 10 Mathematics Assessment was introduced as a replacement for the ISTEP+ Algebra I End-of-Course Assessment (IDOE).

According to the Indiana Department of Education, ISTEP+ items undergo various tests of reliability. Therefore, a test administered over and over to the same student should produce similar scores. Reliability can also be demonstrated in other ways, such as by giving an examinee two halves of a test, with the questions included in each half selected at random, and then comparing the two scores. The reliability statistics for the individual questions and tests are not made public by the Indiana Department of Education or their contracted test vendors.

The Indiana Department of Education content and assessment staff members work with educators from around the state, striving to make sure that the questions on the ISTEP+ tests match the concepts and knowledge that have been identified as Indiana College and Career Readiness Academic Standards to determine validity. The validity statistics for the individual questions and tests are not available on the Indiana Department of Education website and are not made public by the Indiana Department of Education or their contracted test vendors. Regardless of the lack of available reliability and validity information for these assessments, the ISTEP+ testing program is used to measure student academic performance in all public high schools in Indiana.

To compare the difference in student academic achievement between schools with 1:1 technology and those without 1:1 technology, this study used archival student performance data from the 2016 Indiana ISTEP+ English/Language Arts End-of-Course Assessment and 2016 Indiana ISTEP+ 10 English/Language Arts Assessment.

Attendance Rate Data Source

To compare the difference in student attendance rates between schools that had implemented 1:1 technology and those that had not, this study used archival student attendance data for the 2015-16 school year collected from the Indiana Department of Education. Student attendance data are reported yearly by individual schools to the Department of Education as part of the Real-Time Attendance Report. Attendance data for high school students between schools that had implemented 1:1 technology and schools that had not were compared statistically based on data from the 2016 Real-Time Attendance Report.

Graduation Rate Data Source

To compare the difference in student graduation rates between schools that have implemented 1:1 technology and those that have not, this study used archival graduation rate data for the 2015-16 school year from the collected Indiana Department of Education. Student four-year graduation rate data are reported yearly by individual schools to the Department of Education using the Graduation (GR) report. This study used four-year graduation rate data from the 2016 GR report for the sample public high schools. Graduation data for high school students between schools that had implemented 1:1 technology and schools that had not were compared statistically based on data from the 2016 GR Report.

Student Outcome Data Collection

In archival studies, conclusions are drawn from data that has been collected by another person or organization (Jackson, 2014). All student data for this study were collected from the Indiana Department of Education website or through public records requests to the Indiana Department of Education. This study used archival data from both the 2016 English/Language

Arts and Math ISTEP+ End-of-Course Assessments and the 2016 ISTEP+ 10 English/Language Arts Assessment to compare student outcomes in student academic achievement. This study used archival attendance data for the 2015-16 school year, and archival graduation rate data for the class of 2016 to compare student outcomes in attendance and graduation rates

Standardized Assessment Data

The average student pass rates for each sample school for both of the student academic performance indicators were collected and entered into SPSS for analysis. This data included the ISTEP + End of Course Assessment data for the English/Language Arts and the ISTEP+ 10 English/Language Arts tests from the sample high schools.

Attendance and Graduation Data

The average student attendance and graduation rates for each sample school were collected and entered into SPSS for analysis. This study used data for the student attendance rates and student graduation rates found on the Indiana Department of Education website.

Data Analysis

The archival student data collected from the sample public high schools was statistically compared using both descriptive and inferential statistics to draw conclusions.

Standardized Assessment Data

Basic descriptive statistical analysis such as percentages, means, and standard deviations were used to describe the student performance on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment and the 2016 ISTEP+ 10 English/Language Arts Assessment for both schools that had implemented 1:1 technology and those that had not.

To determine if any statistical differences existed in student academic achievement between schools with 1:1 technology and schools without 1:1 technology, inferential analysis using independent samples t-tests were conducted to compare student performance for both the 2016 ISTEP+ English/Language Arts End-of-Course Assessment and the 2016 ISTEP+10 English/Language Arts Assessment.

Data for the specific dependent variable of the percentage of students passing the 2016 ISTEP+ English/Language Arts End-of-Course Assessments and the 2016 ISTEP+ 10 English/Language Arts 10 Assessment were compared between schools that had implemented 1:1 technology and those that had not. An independent samples t-test was used to determine if any differences in student performance on these assessments were statistically significant based on the sample size. Conclusions regarding the effect that 1:1 technology implementation may have had on student academic performance were formed. Also, independent samples t-tests were conducted comparing student academic performance between schools that had implemented 1:1 technology and schools that had not after controlling for the free/reduced lunch percentage and charter school status. Student free/reduced lunch percentage was controlled for to determine if the effect of 1:1 technology on student academic achievement was different when comparing outcomes for students with different socio-economic levels. Charter school status was controlled for to determine if the effect of 1:1 technology implementation on student academic achievement was different between traditional high schools and charter high schools.

This test is appropriate because this study collected the academic performance data from two independent groups taking the same standardized tests after one group had been exposed to 1:1 technology and the other group had not.

Attendance and Graduation Data

Basic descriptive statistical analysis such as percentages, means, and standard deviations were used to describe student attendance and graduation rates for both students that had been exposed to 1:1 technology and those that had not.

To determine if any statistical differences existed in student attendance and graduation rates between schools with 1:1 technology and schools without 1:1 technology, inferential analysis using independent samples t-tests were conducted to compare student attendance and graduation rates for the 2015-16 school year.

Data for the specific dependent variables of the 2016 student attendance rates and student graduation rates were compared between schools that had implemented 1:1 technology and schools that had not. The independent samples t-tests were used to determine if any difference in student attendance or graduation rate data was statistically significant based on the sample size. Conclusions regarding the effect that 1:1 technology implementation may have had on student attendance and graduation rates were formed. Also, independent samples t-tests were conducted comparing student attendance and graduation rates between schools that had implemented 1:1 technology and schools that had not after controlling for free/reduced lunch percentage and charter school status. Student free/reduced lunch percentage was controlled for to determine if the effect of 1:1 technology on student attendance and graduation rates was different when comparing outcomes for students with different socio-economic levels. Charter school status was controlled for to determine if the effect of 1:1 technology implementation on student attendance and graduation rates was different between traditional high schools and charter high schools.

This test is appropriate because this study collected student attendance and graduation rate data from two independent groups of students enrolled in school during the same period after one group had been exposed to 1:1 technology and one group had not.

Limitations

There are five potential limitations of this study. First, the data found on the Indiana Technology Plan Survey that were used to identify schools that had implemented 1:1 technology were collected through self-reported data. The reported 1:1 technology data is assumed to be accurate and appropriately identifying and categorizing schools, however. Secondly, schools across Indiana have implemented 1:1 technology learning environments differently and as a result, there may not be two implementations that are the same. Thirdly, there may be other variables that could have an impact on student outcomes, such as student maturity level, exposure to quality learning experiences, items related to the culture and climate of the individual schools, and other unidentified variables that could not be controlled for. A fourth limitation of this study was that it only utilized data from public high schools in Indiana. Private schools in Indiana are not required to complete surveys or participate in state assessments. Therefore, it was not possible to collect the necessary data for this study from those schools. Finally, according to Downes & Bishop (2015), One of the great challenges with research on 1:1

> programs, in particular, is that 1:1 computing, by definition, signifies the level at which access to technology is available to students. It declares nothing about actual educational practices. One-to-one programs are, therefore, problematic to study and compare, as they describe the ratio of technology access, not necessarily how that technology is being used to promote learning (p. 2).

Summary

The methodology for this study provided a clear description of the sample schools and a solid comparison of the differences in student academic achievement, attendance, and graduation rates between schools with 1:1 technology and those without. The design of this study is descriptive and inferential based on the use of basic statistical analysis. Conclusions were drawn on the differences in student outcomes between schools with 1:1 technology and those without. As a result, the impact that 1:1 technology may have on student outcomes measured by traditional school metrics was investigated as a result of this design.

CHAPTER FOUR: RESULTS

The purpose of this study was to determine if there is a difference in student outcomes between schools that had implemented 1:1 technology learning environments and those that had not. Two particular areas of focus were also considered and controlled for when answering the research questions. Socio-economic status, measured by student free/reduced lunch percentages, for the individual high schools was considered and controlled for when comparing the differences in student outcomes between schools that had 1:1 implementations and those that did not. Also, classification of school as either a traditional high school or a charter high school was considered and controlled for when comparing the differences in student outcome between schools that had 1:1 implementations and those that did not.

To compare differences in student outcomes between high schools with 1:1 technology and high schools without 1:1 technology, the study used quantitative research methods which resulted in descriptive and inferential statistics. The descriptive statistics in this chapter serve as a way to describe the data that were collected and analyzed in this study. The inferential statistics are used to draw statistical conclusions based on the descriptive statistics. All of the data used to formulate both the descriptive and inferential statistics for this study came from archival data collected from the Indiana Department of Education.

The three research questions guiding this study were used to organize this chapter. For each of these research questions, relevant descriptive statistics provide information about the sample schools and their collective student performance outcomes. These statistics include the total number of schools in the sample as well as the schools in the sample that had implemented

a 1:1 learning environment and those that had not. Along with the descriptive statistics, the results from sixteen independent samples t-tests were used to draw conclusions related to 1:1 implementation and student outcomes.

Research Question 1: What is the difference in student academic performance between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?

A series of independent samples t-tests were conducted to examine the difference in student academic performance between high schools that had implemented 1:1 technology and those that had not. Those tests were performed using archival student performance data from the 2016 ISTEP+ English/Language Arts End-of-Course Assessment and the 2016 ISTEP+ 10 English/Language Arts Assessment.

2016 ISTEP+ English/Language Arts End-Of-Course Assessment

Four independent-samples t-tests were conducted using student performance data from the 2016 ISTEP+ English/Language Arts End-Of-Course Assessment. The first test statistically analyzed data for the entire sample. The second test statistically analyzed data from high schools that were below the average 2016 state free/reduced lunch percentage (M=49.3, SD= 18.6). The third test statistically analyzed data from high schools that were above the average 2016 state free/reduced lunch percentage (M=49.3, SD=18.6). The fourth test statistically analyzed data for charter high schools in the sample.

Overall Sample

The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with the 2016 ISTEP+ English/Language Arts End-of-Course Assessment data to determine the number of high schools that were comparable. The data sources indicated that 375 high schools that had completed the survey also had students participate in the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. For the total sample, 232 (62%) high schools reported a 1:1 technology implementation. The number of high schools that reported not having a 1:1 technology implementation was 143 (38%). The high schools with 1:1 technology had a mean student pass percentage of 70 (*SD*=15.2) on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The high schools without 1:1 technology had a mean student pass percentage of 69.1 (SD = 17.6) on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The data indicated that overall, high schools with 1:1 technology had a .9 percent higher average pass rate on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment than high schools without 1:1 technology.

Table 14. ISTEP+ E/ELA ECA: Overall Sample (2016)

	N	Minimum	Maximum	Mean	Std. Deviation
All	375	0	100	69.7	16.1
1:1	232	0	100	70	15.2
Not 1:1	143	15.4	100	69.1	17.6

To draw conclusions from the difference in student performance, an independent-samples t-test was conducted to compare student performance on the 2016 ISTEP+ English/Language

Arts End-of-Course Assessment between high schools with 1:1 technology and high schools without 1:1 technology. Because Levene's test indicated unequal variances between the two sample groups, a *t*-statistic not assuming homogeneity of variance was calculated. The results indicated that there was not a statistically significant difference in the student scores between high schools with 1:1 technology (M=70, SD=15.2) and high schools without 1:1 technology (M=69.1, SD=17.6); t (268.4) =.33, p=.59. This suggests that while there is a difference in student academic performance between high schools with 1:1 technology and high schools without 1:1 technology, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student academic performance.

Free/Reduced Lunch Status

To control for student socio-economic status, the high schools in the study were identified and separated based on how they compared to the 2016 state free/reduced lunch average of 49.3 (SD=18.6) percent (IDOE). After comparing data on the Indiana Technology Plan Survey and 2016 free/reduced lunch data, it was determined that 374 high schools could be compared. The high schools in the study were sorted into two groups based on their relationship to the state student free/reduced lunch average. The number of high schools below the state average was 258 (69%) while the number of high schools above the state average was 116 (31%). After the high schools were sorted, student pass rates on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment were compared between high schools with 1:1 technology and high schools without 1:1 technology.

Schools below the state average. The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with 2016 free/reduced lunch data and the 2016 ISTEP+ English/Language Arts End-of-Course Assessment data to determine the number of high schools that were comparable. The three data sources indicated that 258 high schools reported a below the state average student free/reduced lunch percentage (M=49.3, SD=18.6) and had students that participated in the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The number of high schools with 1:1 technology and a below the state average student free/reduced lunch percentage was 173 (67%), while the number of high schools without 1:1 technology and a below the state average student free/reduced lunch percentage was 85 (33%). The high schools with 1:1 technology and a below the state average student free/reduced percentage had a mean student pass percentage of 75.4 (SD=9.4) on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The high schools without 1:1 technology and a below the state average student free/reduced lunch percentage had a higher mean student pass percentage of 78.1 (SD=9.75) on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The data indicated that high schools with 1:1 technology and a below the state average student free/reduced lunch percentage had a 2.7 percent lower average pass rate on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment compared to high schools without 1:1 technology and a below the state average student free/reduced lunch percentage.

Table 15. ISTEP+ E/ELA ECA: Schools Below State F/R Average Percentage (2016)

	N	Minimum	Maximum	Mean	Std. Deviation
All	258	20	100	76.3	9.6
1:1	173	20	100	75.4	9.4
Not 1:1	85	46.2	100	78.1	9.75

To draw conclusions from the difference in student performance, an independent-samples t-test was conducted to compare student performance on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment between high schools with 1:1 technology and a below the state average student free/reduced lunch percentage and schools without 1:1 technology and a below the state average student free/reduced lunch percentage. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The results revealed a statistically significant difference in the student scores between high schools with 1:1 technology and a below the state average student free/reduced mean percentage (M=75.4, SD=9.43) and schools without 1:1 technology and a below the state average student free/reduced percentage (M=78.1, SD=9.75); t (256) =-2.09, p =.038. This suggests that not introducing 1:1 technology into high schools with a higher socio-economic status may result in better student academic performance on English/Language Arts assessments. Specifically, this suggests that 1:1 technology implementation may have a negative effect on student academic performance in high schools with students who have a high socio-economic status.

Schools above the state average. The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced

with 2016 free/reduced lunch data and the 2016 ISTEP+ English/Language Arts End-of-Course Assessment data to determine the number of high schools that were comparable. The three data sources indicated that 116 high schools reported a student free/reduced lunch percentage above the state average (*M*=49.3, *SD*=18.6) and had students that participated in the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The number of high schools with 1:1 technology and an above the state average student free/reduced lunch percentage was 59 (51%) while the number of high schools without 1:1 technology and an above the state average student free/reduced lunch percentage was 57 (49%). The high schools with 1:1 technology and an above the state average student free/reduced percentage had a mean student pass percentage of 54.3 *(SD*=17.9) on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The high schools without 1:1 technology and an above the state average student free/reduced lunch percentage and not to have a 1:1 had a slightly better mean student pass percentage of 55.9 (*SD*=18.4) on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The data reveal that high schools with 1:1 technology and an above the state average student free/reduced lunch percentage had a 1.6 percent lower average pass rate on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment compared to high schools without 1:1 technology and an above the state average student free/reduced lunch percentage.

Table 16. ISTEP+ E/ELA ECA: Schools Above Average State F/R Lunch Percentage (2016)

	N	Minimum	Maximum	Mean	Std. Deviation
All	116	0	100	55	18.1
1:1	59	0	93	54.3	17.9
Not 1:1	57	15.4	100	55.9	18.4

To draw conclusions from the difference in student performance, an independent-samples t-test was conducted to compare student performance on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment for high schools with 1:1 technology and an above the state average student free/reduced lunch percentage and high schools without 1:1 technology and an above the state average student free/reduced lunch percentage. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The results revealed that there was not a statistically significant difference in the student scores between high schools with 1:1 technology and an above the state average student free/reduced lunch percentage (M=54.3, SD=17.9) and high schools without 1:1 technology and an above the state average student free/reduced lunch percentage (M=55.9, SD=18.4); t (114) = -.47, p=.64. This suggests that while there is a difference in student academic performance between high schools with 1:1 technology and high schools without 1:1 technology with students who have a lower than average social-economic status, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student academic performance in high schools with students that are less affluent than the state average.

Charter Schools

The 2016 Indiana Technology Plan Survey was used to identify charter high schools that had reported a 1:1 technology environment and charter high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with the 2016 ISTEP+ English/Language Arts End-of-Course Assessment data to determine the number of charter high schools that were comparable. Both data sources indicated that 32 charter high schools had

completed the survey and had students that participated in the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The number of charter high schools with 1:1 technology was 11 (34%) while the number of charter high schools without 1:1 technology implementation was 21 (66%). The charter high schools with 1:1 technology had a mean student pass percentage of 52.3 (*SD*=24.4) on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The charter high schools without 1:1 technology had a higher mean student pass percentage of 64.6 *(SD*=18.8) on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment. The data indicated that charter high schools with 1:1 technology had a 12.3 percent lower average pass rate on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment compared to charter high schools without 1:1 technology.

Table 17. ISTEP+ E/ELA ECA: Charter Schools (2016)

	N	Minimum	Maximum	Mean	Std. Deviation
All	32	0	100	60.4	21.3
1:1	11	0	93	52.3	24.4
Not 1:1	21	34.6	100	64.6	18.8

To draw conclusions from the difference in student performance, an independent-samples t-test was conducted to compare student performance on the 2016 ISTEP+ English/Language Arts End-of-Course Assessment for charter high schools with 1:1 technology and charter high schools without 1:1 technology. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The results revealed that there was not a statistically significant difference in the student scores between charter high schools with 1:1 technology (*M*=52.3, *SD*=24.4) and charter high schools without 1:1 technology (*M*=64.6, *SD*=18.8); $t\ (30) = -1.59$, $p=0.122$. This suggests that while there is a

difference in student academic performance between charter high schools with 1:1 technology and charter high schools without 1:1 technology, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student academic performance in charter high schools.

2016 ISTEP+ 10 English/Language Arts

Four independent-samples t-test were conducted using student performance data from the 2016 ISTEP+ 10 English/Language Arts Assessment. The first test statistically analyzed data for the entire sample. The second test statistically analyzed data for high schools that were below the average 2016 state free/reduced lunch percentage (M=49.3, SD=18.6). The third test statistically analyzed data for high schools that were above the average 2016 state free/reduced lunch percentage (M=49.3, SD=18.6). The fourth test statistically analyzed data for charter high schools in the sample.

Overall Sample

The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with the 2016 ISTEP+ 10 English/Language Assessment data to determine the number of high schools that were comparable. Both data sources indicated that 365 high schools completed the survey and had students that participated in the 2016 ISTEP+ 10 English/Language Assessment. The number of high schools with 1:1 technology was 232 (64%) while the number of high schools without 1:1 technology was 133 (36%). The high schools with 1:1 technology had a mean student pass percentage of 55.9 (SD=14.7) on the 2016 ISTEP+ 10 English/Language Arts Assessment. The

high schools without 1:1 technology had a mean student pass percentage of 53.8 (*SD*=17.2) on the 2016 ISTEP+ 10 English/Language Arts Assessment. The data demonstrate that overall, high schools with 1:1 technology had a 1.7 percent higher average pass rate on the 2016 ISTEP+ 10 English/Language Arts Assessment compared to high schools without 1:1 technology.

Table 18. ISTEP+ 10 E/ELA: Overall Sample (2016)

	N	Minimum	Maximum	Mean	Std. Deviation
All	365	0	98.7	55.1	15.7
1:1	232	0	88.9	55.9	14.7
Not 1:1	133	5.9	98.7	53.8	17.2

To draw conclusions from the difference in student performance, an independent-samples t-test was conducted to compare student performance on the 2016 ISTEP+ 10 English/Language Arts Assessment for high schools with 1:1 technology and high schools without 1:1 technology. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The results revealed that there was not a statistically significant difference in the student scores between high schools with 1:1 technology (*M*=55.9, *SD*=14.7) and high schools without 1:1 technology (*M*=53.8, *SD*=17.2); *t* (363) =1.03, *p*=.21. This suggests that while there is a slight difference in student academic performance between high schools with 1:1 technology and high schools without 1:1 technology, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student academic performance.

Free/Reduced Lunch

To control for student socio-economic status, the high schools in the study were identified and separated based on how they compared to the 2016 state free/reduced lunch

average of 49.3 (*SD*=18.6) percent (IDOE). After comparing data on the Indiana Technology Plan Survey and 2016 free/reduced lunch data, it was determined that 364 high schools could be compared. The high schools in the study were sorted into two groups based on their relationship to the state student free/reduced lunch average. The number of high school below the state average was 257 (71%) while the number of high schools above the state average was 107 (29%). After the high schools were sorted, student pass rates on the 2016 ISTEP+ 10 English/Language Assessment were compared between high schools with 1:1 technology and high schools without 1:1 technology.

Schools below the state average. The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with the 2016 free/reduced lunch data and 2016 ISTEP+ 10 English/Language Assessment data to determine the number of high schools that were comparable. The three data sources indicated that 257 high schools reported a student free/reduced lunch percentage below the state average (*M*=49.3, *SD*=18.6) and had students that participated in the 2016 ISTEP+ 10 English/Language Arts Assessment. The number of high schools with 1:1 technology and a below the state average student free/reduced lunch percentage was 173 (67%) while the number of schools without 1:1 technology and a below the state average student free/reduced lunch percentage was 84 (33%). The high schools with 1:1 technology and a below the state average student free/reduced percentage had a mean student pass percentage of 60.4 (*SD*=10.7) on the 2016 ISTEP+ 10 English/Language Arts Assessment, while the high schools without 1:1 technology and a below the state average student free/reduced lunch percentage had a mean student pass percentage of

61.7 (SD=13) on the 2016 ISTEP+ 10 English/Language Arts Assessment. The data demenstrated that high schools with 1:1 technology and a below the state average student free/reduced lunch percentage had a 1.3 percent lower average pass rate technology on the 2016 ISTEP+ 10 English/Language Arts Assessment compared to high schools without 1:1 technology and a below the state average student free/reduced lunch percentage.

Table 19. ISTEP+ 10 E/LA Schools Below Average State F/R Lunch Percentage (2016)

	N	Minimum	Maximum	Mean	Std. Deviation
All	257	16.7	98.7	60.8	11.5
1:1	173	29.6	88.9	60.4	10.7
Not 1:1	84	16.7	98.7	61.7	13

To draw conclusions from the difference in student performance, an independent-samples t-test was conducted to compare student performance on the 2016 ISTEP+ 10 English/Language Assessment for high schools with 1:1 technology an a below the state average student free/reduced lunch percentage and high schools without 1:1 technology an a below the state average student free/reduced lunch percentage. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The results revealed that there was not a statistically significant difference in the student scores between high schools with 1:1 technology and a below the state free/reduced mean percentage (M=60.4, SD=10.7) and high schools without 1:1 technology and a below the state free/reduced mean percentage (M=61.7, SD=13; t (255) =-.87, p=.39. This suggests that while there is a difference in student academic performance between high schools with 1:1 technology and high schools without 1:1 technology with students who have a higher than average social-economic status, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that

1:1 technology implementation may not have an effect on student academic performance in schools with students that are more affluent than the state average.

Schools above the state average. The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with the 2016 free/reduced lunch data and 2016 ISTEP+ 10 English/Language Arts Assessment data to determine the number of high chools that were comparable. The three data sources indicated that 107 high schools had reported a student free/reduced lunch percentage above the state average (M=49.3. SD=18.6) and had students that participated in the 2016 ISTEP+ 10 English/Language Arts Assessment. The number of high schools with 1:1 technology and an above the state average student free/reduced lunch percentage was 59 (55%) while the number of high schools without 1:1 technology and an above the state average student free/reduced lunch percentage was 48 (45%). The high schools with 1:1 technology and an above the state average student free/reduced lunch percentage had a mean student pass percentage of 43 (SD=17.2) on the 2016 ISTEP+ 10 English/Language Arts Assessment. The high schools without 1:1 technology and an above the state average student free/reduced lunch percentage had a mean student pass percentage of 40 (SD=15) on the 2016 ISTEP+ 10 English/Language Arts Assessment. The data revealed that high schools with 1:1 technology and an above the average the state student free/reduced lunch percentage had a 3 percent higher average pass rate on the 2016 ISTEP+ 10 English/Language Arts Assessment compared to high schools without 1:1 technology and an above the state average student free/reduced lunch percentage.

Table 20. ISTEP+ 10 E/LA: Schools Above Average State F/R Lunch Percentage (2016)

	N	Minimum	Maximum	Mean	Std. Deviation
All	107	0	78.9	41.6	16.2
1:1	59	0	78.9	43	17.2
Not 1:1	48	5.9	64.6	40	15

To draw conclusions from the difference in student performance, an independent-samples t-test was conducted to compare student performance on the 2016 ISTEP+ 10 English/Language Assessment for high schools with 1:1 technology and an above the state average student free/reduced lunch percentage and high schools without 1:1 technology and an above the state average student free/reduced lunch percentage. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The results revealed that there was not a statistically significant difference in the student scores between high schools with 1:1 technology and an above the state average student free/reduced lunch percentage (M=43, SD=17.2) and high schools without 1:1 technology and an above the state average student free/reduced lunch percentage (M=40, SD=15); t (105) = .96, p=.34. This suggests that while there is a difference in student academic performance between high schools with 1:1 technology and high schools without 1:1 technology with students who have a lower than average social-economic status, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student graduation rates in schools with students that are less affluent than the state average.

Charter Schools

The 2016 Indiana Technology Plan Survey was used to identify charter high schools that had reported a 1:1 technology environment and charter high schools that had not. The data from

the 2016 Indiana Technology Plan Survey was then cross-referenced with the 2016 ISTEP+ 10 English/Language Arts Assessment data to determine the number of charter high schools that were comparable. Both data sources indicated that 22 charter high schools had completed the survey and had students that participated in the 2016 ISTEP+ 10 English/Language Assessment. The number of charter high schools in the sample with 1:1 technology and without 1:1 technology was even. The charter high schools with 1:1 technology had a mean student pass percentage of 36.3 (*SD*=22.2) on the 2016 ISTEP+ 10 English/Language Arts Assessment. The charter high schools without 1:1 technology had a mean student pass percentage of 51.7 (*SD*=28.9) on the 2016 ISTEP+ 10 English/Language Arts Assessment. The data indicated that charter high schools with 1:1 technology had a 15.4 percent lower average pass rate compared to charter high schools without 1:1 technology on the 2016 ISTEP+ 10 English/Language Arts Assessment.

Table 21. ISTEP+ 10 E/LA: Charter Schools (2016)

	N	Minimum	Maximum	Mean	Std. Deviation
All	22	0	98.7	44	26.2
1:1	11	0	65.7	36.3	22.2
Not 1:1	11	16.7	98.7	51.7	28.9

To draw conclusions from the difference in student performance, an independent-samples t-test was conducted to compare student performance on the 2016 ISTEP+ 10 English/Language Arts Assessment for charter high schools with 1:1 technology and charter high schools without 1:1 technology. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The result revealed that there was not a statistically significant difference in the student scores between charter high schools with

1:1 technology (*M*=36.3, *SD*=22.2) and charter high schools without 1:1 technology (*M*=51.7, *SD*=28.6); *t* (20) =-1.41, *p*=.17. This suggests that while there is a difference in academic achievement between charter high schools with 1:1 technology and charter high schools without 1:1 technology that the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student academic achievement in charter high schools.

Research Question 2: What is the difference in student attendance rates between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?

A series of independent samples t-tests were conducted to examine the difference in student attendance rates between high schools that had implemented 1:1 technology and those that had not. Those tests were performed using archival student attendance data from the 2015-16 school year.

Overall Sample

The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with 2015-16 student attendance data to determine the number of high schools that were comparable. Both data sources indicated that 375 high schools had completed the survey and had reported student attendance data. The number of high schools with 1:1 technology was 232 (62%) while the number of high schools without 1:1 technology was 143 (38%). The high schools with 1:1 technology had a mean student attendance rate of 94.8 (*SD*=3.59) for the 2015-16 school year. The high schools without

1:1 technology had a mean student attendance rate of 93.4 (*SD*=5.14) for the 2015-16 school year. The data revealed that overall, high schools with 1:1 technology had a 1.4 percent higher average attendance rate than high schools without 1:1 technology.

Table 22. Attendance Rate: Overall Sample (2015-16)

	N	Minimum	Maximum	Mean	Std. Deviation
All	375	55.9	99.1	94.3	4.3
1:1	232	55.9	99.1	94.8	3.59
Not 1:1	143	68.2	98.3	93.4	5.14

To draw conclusions from the difference in student attendance rates, an independent-samples t-test was conducted to compare 2015-16 student attendance rates for high schools with 1:1 technology and high schools without 1:1 technology. Because Levene's test indicated unequal variances between the two sample groups, a *t*-statistic not assuming homogeneity of variance was calculated. The results revealed that there was a statistically significant difference in student attendance rates between high schools with 1:1 technology (*M*=94.8, *SD*=3.59) and high schools without 1:1 technology (*M*=93.4, *SD*=5.14); $t\ (227) = 3$, $p=0.003$. This suggests that the introduction of 1:1 technology may result in higher student attendance rates. Specifically, this suggests that 1:1 technology implementation may positively affect student attendance rates.

Free/Reduced Lunch

To control for student socio-economic status the high schools in the study were identified and separated based on how they compared to the 2016 state free/reduced lunch average of 49.3 (*SD*=18.6) percent (IDOE). After comparing data on the Indiana Technology Plan Survey and 2016 free/reduced lunch data, it was determined that 374 high schools could be compared. The high schools in the study were sorted into two groups based on their relationship to the state

student free/reduced lunch average. The number of high school below the state average was 258 (69%) while the number of high schools above the state average was 116 (31%). After the high schools were sorted, student attendance rates were compared between high schools with 1:1 technology and high schools without 1:1 technology.

Schools below the state average. The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with 2016 free/reduced lunch data and 2015-16 student attendance data to determine the number of schools that were comparable. The three data sources indicated that 258 high schools reported a student free/reduced lunch percentage below the state average (M=49.3, SD=18.6) and had reported student attendance data for the 2015-16 school year. The number of high schools with 1:1 technology and a below the state average student free/reduced lunch percentage was 173 (67%) while the number of high schools without 1:1 technology and a below the state average student free/reduced lunch percentage was 85 (33%). The high schools with 1:1 technology and a below the state average student free/reduced lunch percentage had a mean student attendance rate of 95.4 (SD=3.12) for the 2015-16 school year. The high schools without 1:1 technology and a below the state average student free/reduced lunch percentage had a mean student attendance rate of 95.3 (SD=3.23) for the 2015-16 school year. The data revealed that high schools with 1:1 technology and a below the state average student free/reduced lunch percentage had an average student attendance rate for the 2015-16 school year that was slightly better than the high schools without 1:1 technology and a below the state average student free/reduced lunch percentage.

Table 23. Attendance Rate: Schools Below Average State F/R Lunch Percentage (2015-16)

	N	Minimum	Maximum	Mean	Std. Deviation
All	258	55.9	99.1	95.3	3.21
1:1	173	55.9	99.1	95.4	3.21
Not 1:1	85	68.2	98.3	95.3	3.23

To draw conclusions from the difference in student attendance rates, an independent-samples t-test was conducted to compare 2015-16 student attendance rates for high schools with 1:1 technology and a below the state average student free/reduced lunch percentage and high schools without 1:1 technology and a below the state average student free/reduced lunch percentage. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The results revealed that there was not a statistically significant difference in the student attendance rates between high schools with 1:1 technology and a below the state average student free/reduced percentage (M=95.4, SD=3.21) and high schools without 1:1 technology and a below the state average student free/reduced percentage (M=95.3, SD=3.23); t (256) = .24, p=.81. This suggests that while there is a slight difference in student attendance rates between high schools with 1:1 technology and high schools without 1:1 technology with students who have a higher than average social-economic status, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student attendance rates in schools with students that are more affluent than the state average.

Schools above the state average. The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced

with 2016 free/reduced lunch data and 2015-16 student attendance data to determine the number of schools that were comparable. The three data sources indicated that 116 high schools had reported a student free/reduced lunch percentage above the state average (*M*=49.3, *SD*=18.6) and had reported student attendance data for the 2015-16 school year. The number of high schools with 1:1 technology and an above the state average student free/reduced lunch percentage was 59 (51%) while the number of high schools without 1:1 technology and an above the state average state student free/reduced lunch percentage was 57 (49%). The high schools with 1:1 technology and an above the state average student free/reduced lunch percentage had a mean student attendance rate of 93.2 (*SD*=4.14) for the 2015-16 school year. The high schools without 1:1 technology and an above the state average student free/reduced lunch percentage had a mean student attendance rate of 90.5 (*SD*=6.13 for the 2015-16 school year. The data revealed that high schools with 1:1 technology and an above the state average student free/reduced lunch percentage had a 2.7 percent higher student attendance rate than high schools without 1:1 technology an above the state average student free/reduced lunch percentage for the 2015-16 school year.

Table 24. Attendance Rate: Schools Above Average State F/R Lunch Percentage (2015-16)

	N	Minimum	Maximum	Mean	Std. Deviation
All	116	73.4	98.6	91.9	5.36
1:1	59	80.5	98.6	93.2	4.14
Not 1:1	57	73.4	96.5	90.5	6.13

To draw conclusions from the difference in student attendance rates, an independent-samples t-test was conducted to compare 2015-16 student attendance rates for high schools with 1:1 technology and an above the state average student free/reduced lunch percentage and high

schools without 1:1 technology and an above the state free/reduced lunch mean percentage. Because Levene's test indicated unequal variances between the two sample groups, a *t*-statistic not assuming homogeneity of variance was calculated. The results revealed that there was a statistically significant difference in the student attendance rates between high schools with 1:1 technology and an above the state average student free/reduced percentage (M=93.2, SD=4.14) and high schools without 1:1 technology and an above the state average student free/reduced percentage (M=90.5, SD=6.13); t (97.9) = 2.76, p=.007. This suggests that the introduction of 1:1 technology may affect attendance rates in schools with a high percentage of students qualifying for free/reduced lunch. Specifically, this suggests that 1:1 technology implementation may improve student attendance in schools with students who have a lower than average socio-economic status.

Charter Schools

The 2016 Indiana Technology Plan Survey was used to identify charter high schools that had reported a 1:1 technology environment and charter high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with 2015-16 student attendance data to determine the number of charter high schools that were comparable. Both data sources indicated that 32 charter high schools had completed the survey and had reported student attendance data for the 2015-16 school year. The number of charter high schools with 1:1 technology was 11 (34%) while the number of charter high schools without 1:1 technology was 21 (66%). The charter high schools with 1:1 technology had a mean student attendance rate of 93.6 (SD=3.92) for the 2015-16 school year. The charter high schools without 1:1 technology had a mean student attendance rate of 87.4 (SD=9.33) for the 2015-16 school year. The data

reveal that charter high schools with 1:1 technology had a 6.2 percent higher average student attendance rate for the 2015-16 school year than charter high schools without 1:1 technology.

Table 25. Attendance Rate: Charter Schools (2015-16)

	N	Minimum	Maximum	Mean	Std. Deviation
All	32	68.2	99.1	89.5	8.38
1:1	11	87.9	99.1	93.6	3.92
Not 1:1	21	68.2	98.3	87.4	9.33

To draw conclusions from the difference in student attendance rates, an independent-samples t-test was conducted to compare 2015-16 student attendance rates performance for charter high schools with 1:1 technology and charter high schools without 1:1 technology. Because Levene's test indicated unequal variances between the two sample groups, a *t*-statistic not assuming homogeneity of variance was calculated. The results revealed that there was a statistically significant difference in the student attendance rates between charter high schools with 1:1 technology (M=93.6, SD=3.92) and charter high schools without 1:1 technology (M=87.4, SD=9.33); t (29.1) = 2.7, p=.013. This suggests that 1:1 technology implementation may have an effect on student attendance in charter high schools. Specifically, this suggests that the introduction of 1:1 technology may result in higher student attendance rates in charter high schools.

Research Question 3: What is the difference in student graduation rates between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?

A series of independent samples t-tests were conducted to examine the difference in student graduation rates between high schools that had implemented 1:1 technology and those

that had not. Those tests were performed using archival student graduation rate data from the 2015-16 school year.

Overall Sample

The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with 2016 graduation data to determine the number of high schools that were comparable. Both data sources indicated that 370 high schools had completed the survey and had reported student graduation data. The number of high schools with 1:1 technology was 229 (62%) while the number of high schools without 1:1 technology was 141 (38%). The high schools with 1:1 technology had a mean student graduation rate of 90.5 (*SD*=12.1) in 2016. The high schools without 1:1 technology had a mean student graduation rate of 85.1 (*SD*=21.3 in 2016. The data revealed that overall, high schools with 1:1 technology had a 5.4 percent higher average graduation rate in 2016 than high schools without 1:1 technology.

Table 26. Graduation Rate: Overall Sample (2015-16)

	N	Minimum	Maximum	Mean	Std. Deviation
All	370	0	100	88.4	16.4
1:1	229	19.9	100	90.5	12.1
Not 1:1	141	0	100	85.1	21.3

To draw conclusions from the difference in student graduation rates, an independent-samples t-test was conducted to compare 2016 student graduation rates for high schools with 1:1 technology and high schools without 1:1 technology. Because Levene's test indicated unequal variances between the two sample groups, a *t*-statistic not assuming homogeneity of variance

was calculated. The results revealed that there was a statistically significant difference in the 2016 student graduation rates between high schools with 1:1 technology (M=90.5, SD=12.1) and high schools without 1:1 Technology (M=85.1, SD=21.3); t (197) = 2.8, p=.006. This suggests that 1:1 technology implementation may affect graduation rates. Specifically, this suggests that the introduction of 1:1 technology may increase the number of students that graduate from high school.

Free/Reduced Lunch

To control for student socio-economic status the high schools in the study were identified and separated based on how they compared to the 2016 state free/reduced lunch average of 49.3 (SD=18.6) percent (IDOE). After comparing data on the Indiana Technology Plan Survey and 2016 free/reduced lunch data, it was determined that 370 high schools could be compared. The high schools in the study were sorted into two groups based on their relationship to the state free/reduced lunch average. The number of high school below the state average was 258 (70%) while the number of high schools above the state average was 112 (30%). After the high schools were sorted, student graduation rates were compared between high schools with 1:1 technology and high schools without 1:1 technology.

Schools below the state average. The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with 2016 free/reduced lunch data and 2016 student graduation rate data to determine the number of high schools that were comparable. The three data sources indicated that 258 high schools reported a student free/reduced lunch percentage below the state average (M=49.3, SD=18.6) and

had reported student graduation rate data for 2016. The number of high schools with 1:1 technology and a below the state average student free/reduced lunch percentage was 173 (67%) while the number of high schools without 1:1 technology and a below the state average student free/reduced lunch percentage was 85 (33%). The high schools with 1:1 technology and a below the state average student free/reduced percentage had a mean student graduation rate of 93.2 (*SD*=6.91) in 2016. The high schools without 1:1 technology and a below the state average student free/reduced lunch percentage had a mean student attendance rate of 91.5 (*SD*=13.3) in 2016. The data revealed that high schools with 1:1 technology and a below the state average student free/reduced lunch percentage had an average student graduation rate in 2016 that was 1.7 percent greater than the high schools without 1:1 technology and a below the state average student free/reduced lunch percentage.

Table 27. Graduation Rate: Schools Below Average State F/R Lunch Percentage (2015-16)

	N	Minimum	Maximum	Mean	Std. Deviation
All	258	18.7	100	92.6	9.49
1:1	173	31.9	100	93.2	6.91
Not 1:1	85	18.7	100	91.5	13.3

To draw conclusions from the difference between student graduation rates, an independent-samples t-test was conducted to compare 2016 student graduation rates for high schools with 1:1 technology an a below the state average student free/reduced lunch percentage and high schools withouth 1:1 technology and a below the state average student free/reduced lunch percentage. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The results revealed that there was not a statistically significant difference in the 2016 student graduation rates between

high schools with 1:1 technology and a below the state average student free/reduced percentage (*M*=93.2, *SD*=6.91) and high schools without 1:1 technology and a below the state average student free/reduced percentage (*M*=91.5, *SD*=13.3); *t* (256) = 1.35, *p*=.18. This suggests that while there is a difference in student graduation rates between high schools with 1:1 technology and high schools without 1:1 technology with students who have a higher than average social-economic status, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student graduation rates in schools with students that are more affluent than the state average.

Schools above the state average. The 2016 Indiana Technology Plan Survey was used to identify high schools that had reported a 1:1 technology environment and high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with 2016 free/reduced lunch data and 2016 student graduation rate data to determine the number of high schools that were comparable. The three data sources indicated that 112 high schools reported a student free/reduced lunch percentage above the state average (*M*=49.3, *SD*=18.6) and had reported student graduation rate data for 2016. The number of high schools with 1:1 technology and an above the state average student free/reduced lunch was 56 (50%) while the number of high schools without 1:1 technology and an above the state average student free/reduced lunch percentage was 56 (50%). The high schools with 1:1 technology and an above the state average student free/reduced percentage had a mean student graduation rate of 82.2 (*SD*=19.2) in 2016. The high schools without 1:1 technology and an above the state average student free/reduced lunch percentage had a mean student graduation rate of 75.3 (*SD*=26.9) for 2016. The data revealed that high schools with 1:1 technology and an above the

state average student free/reduced lunch percentage had a 6.9 percent higher student graduation rate in 2016 than high schools without 1:1 technology and an above the state average student free/reduced lunch percentage.

Table 28. Graduation Rate: Schools Above Average State F/R Lunch Percentage (2015-16)

	N	Minimum	Maximum	Mean	Std. Deviation
All	112	0	100	78.8	23.5
1:1	56	19.9	100	82.2	19.2
Not 1:1	56	0.0%	100	75.3	26.9

To draw conclusions from the difference in student graduation rates, an independent-samples t-test was conducted to compare the 2016 student graduation rates for high schools with 1:1 technology and an above the state average student free/reduced lunch percentage and high schools without 1:1 technology and an above the state average student free/reduced lunch percentage. Because Levene's test indicated unequal variances between the two sample groups, a *t*-statistic not assuming homogeneity of variance was calculated. The results revealed that there was not a statistically significant difference in the 2016 student graduation rates between high schools with 1:1 technology and an above the state average student free/reduced mean percentage (M=82.2, SD=19.2) and high schools without 1:1 technology and an above the state average student free/reduced percentage (M=75.3, SD=26.9); t (100) = 1.56, p=.12. This suggests that while there is a difference in student graduation rates between high schools with 1:1 technology and high schools without 1:1 technology with students who have a lower than average social-economic status, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student graduation rates in schools with students that are less affluent than the state average.

Charter Schools

The 2016 Indiana Technology Plan Survey was used to identify charter high schools in Indiana that had reported a 1:1 technology environment and charter high schools that had not. The data from the 2016 Indiana Technology Plan Survey was then cross-referenced with 2016 student graduation rate data to determine the number of charter high schools that were comparable. Both data sources indicated that 28 charter high schools had completed the survey and had reported student graduation rate data for 2016. The number of charter high schools with 1:1 technology was 8 (29%) while the number of charter high schools without 1:1 technology was 20 (71%). The charter high schools with 1:1 technology had a mean student graduation rate of 70.6 (*SD*=30.9) in 2016. The charter high schools without 1:1 technology had a mean student graduation rate of 45.9 (*SD*=33.6) in 2016. The data revealed that charter high schools with 1:1 technology had a 24.7 percent higher average student graduation rate in 2016 than charter high schools without 1:1 technology.

Table: 29. Graduation Rate: Charter Schools (2015-16)

	N	Minimum	Maximum	Mean	Std. Deviation
All	28	0	100	53	34.2
1:1	8	22.7	98.2	70.6	30.9
Not 1:1	20	0	100	45.9	33.6

To draw conclusions from the difference in student graduation rates, an independent-samples t-test was conducted to compare the 2016 student graduation rates for charter high schools with 1:1 technology and charter high schools without 1:1 technology. Because Levene's test indicated equal variances between the two sample groups, a *t*-statistic assuming homogeneity of variance was calculated. The results revealed that there was not a statistically significant

difference in the 2016 student graduation rates between charter high schools with 1:1 technology (*M*=70.6, *SD*=30.9) and charter high schools without 1:1 technology (*M*=45.9, *SD*=33.6); *t* (26) =1.8, *p*=.084. This suggests that while there is a difference in student graduation rates between charter high schools with 1:1 technology and charter high schools without 1:1 technology, the difference is likely not a result of the 1:1 technology. Specifically, this suggests that 1:1 technology implementation may not have an effect on student graduation rates in charter high schools.

Summary of Results

To answer the research questions guiding this study, data for 1:1 technology implementations and student performance data were collected and analyzed for English/Language Arts standardized tests, student attendance rates, and student graduation rates from 375 public high schools in Indiana. A series of sixteen independent-samples t-tests were conducted to compare the differences in student outcomes between high schools with 1:1 technology and high schools without 1:1 technology.

Student Academic Performance

To compare the difference in student academic performance between high schools with 1:1 technology and those without, student performance data for the 2016 ISTEP+ English/Language Arts End-of-Course Assessment and the 2016 ISTEP+ 10 English/Language Arts Assessment were collected and compared statistically using independent-samples t-tests.

ISTEP+ English/Language Arts End-of-Course Assessment

For the overall sample, students enrolled in the high schools (*N*=232) that had received the treatment of 1:1 technology (*M*=70, *SD*=15.2) scored slightly higher on the ISTEP+

English/Language Arts End-of-Course Assessment than students enrolled in high schools (*N*=143) that had not received the treatment of 1:1 technology (*M*=69.1, *SD*=17.6). The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.59), suggesting that this difference was not likely a result of the 1:1 technology implementation.

When controlled for socio-economic status, students enrolled in the high schools (*N*=173) that were below the state average student free/reduced lunch percentage (*M*=49.3, *SD*=18.6) and had received the treatment of 1:1 technology (*M*=75.4, SD=9.4) scored lower on the ISTEP+ English/Language Arts End-of-Course Assessment than students enrolled in the high schools (*N*=85) that had not received the treatment of 1:1 technology *(M*=78.1, SD=9.75). The results of an independent samples t-test indicated that this difference was statistically significant (*p*=.038), suggesting that this difference may have been a result of the 1:1 technology implementation.

Students enrolled in the high schools (*N*=59) that were above the state average student free/reduced lunch percentage (*M*=49.3, *SD*=18.6) and had received the treatment of 1:1 technology (*M*=54.3, SD=17.9) scored lower on the ISTEP+ English/Language Arts End-of-Course Assessment than students enrolled in the high schools (*N*=57) that had not received the treatment of 1:1 technology *(M*=55.9, SD=18.4). The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.64), suggesting that this difference was not likely a result of the 1:1 technology implementation.

When controlled for charter school status, students enrolled in charter high schools (*N*=11) that had received the treatment of 1:1 technology (*M*=52.3, *SD*=24.4) scored lower on the ISTEP+ English/Language Arts End-of-Course Assessment than students enrolled in the

charter high schools (*N*=21) that had not received the treatment of 1:1 technology (*M*=64.6, *SD*=18.8). The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.122) suggesting that this difference was not likely a result of the 1:1 technology implementation.

ISTEP + 10 English/Language Arts Assessment

For the overall sample, students enrolled in the high schools (*N*=232) that had received the treatment of 1:1 technology (*M*=55.9, *SD*=14.7) scored slightly higher on the ISTEP+ 10 English/Language Arts Assessment than students enrolled in high schools (*N*=133) that had not received the treatment of 1:1 technology (*M*=53.8, *SD*=17.2). The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.21), suggesting that this difference was not likely a result of the 1:1 technology implementation.

When controlled for socio-economic status, students enrolled in the high schools (*N*=173) that were below the state average student free/reduced lunch percentage (*M*=49.3, *SD*=18.6) and had received the treatment of 1:1 technology (*M*=60.4, SD=10.7) scored lower on the ISTEP+ 10 English/Language Assessment than students enrolled in the high schools (*N*=84) that had not received the treatment of 1:1 technology *(M*=61.7, SD=13). The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.39), suggesting that this difference was not likely a result of the 1:1 technology implementation.

Students enrolled in the high schools (*N*=59) that were above the state average student free/reduced lunch percentage (*M*=49.3, *SD*=18.6) and had received the treatment of 1:1 technology (*M*=43, SD=17.2) scored higher on the ISTEP+ 10 English/Language Assessment than students enrolled in the high schools (*N*=48) that had not received the treatment of 1:1

technology *(M*=40, SD=15). The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.34), suggesting that this difference was not likely a result of the 1:1 technology implementation.

When controlled for charter school status, students enrolled in charter high schools (N = 11) that had received the treatment of 1:1 technology (*M*=36.3, *SD*=22.2) scored lower on the ISTEP+ 10 English/Language Arts Assessment than students enrolled in the charter high schools (*N*=11) that had not received the treatment of 1:1 technology (*M*=51.7, *SD*=28.9). The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.17) suggesting that this difference was not likely a result of the 1:1 technology implementation.

Student Attendance Rate

To compare the difference in student attendance rates between schools with 1:1 and those without, attendance rate data from the 2015-2016 school year were collected and compared statistically using independent-samples t-tests.

For the overall sample, students enrolled in the high schools (*N*=232) that had received the treatment of 1:1 technology (*M*=94.8, *SD*=3.59) had a higher attendance rate than students enrolled in high schools (*N*=143) that had not received the treatment of 1:1 technology (*M*=93.4, *SD*=5.14). The results of an independent samples t-test indicated that this difference was statistically significant (*p*=.003), suggesting that this difference may have been a result of the 1:1 technology implementation.

When controlled for socio-economic status, students enrolled in the high schools (*N*=173) that were below the state average student free/reduced lunch percentage (*M*=49.3, *SD*=18.6) and

had received the treatment of 1:1 technology (*M*=95.4, *SD*=3.21) had a virtually equal attendance rate to students enrolled in the high schools (*N*=85) that had not received the treatment of 1:1 technology (*M*=95.3, *SD*=3.23) . The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.81), suggesting that this difference was not likely a result of the 1:1 technology implementation.

Students enrolled in the high schools (*N*=59) that were above the state average student free/reduced lunch percentange (*M*=49.3, *SD*=18.6) and had received the treatment of 1:1 technology (*M*=93.2, *SD*=4.14) had a higher student attendance rate than students enrolled in the high schools (*N*=57) that had not received the treatment of 1:1 technology (*M*=90.5, *SD*= 6.13). The results of an independent samples t-test indicated that this difference was statistically significant (*p*=.007), suggesting that this difference may have been a result of the 1:1 technology implementation.

When controlled for charter school status, students enrolled in charter high schools (N=11) that had received the treatment of 1:1 technology (*M*=93.6, *SD*=3.92) had a higher attendance rate than students enrolled in the charter high schools (*N*=21) that had not received the treatment of 1:1 technology (*M*=87.4, *SD*=9.33). The results of an independent samples t-test indicated that this difference was statistically significant (*p*=.013), suggesting that this difference may have been a result of the 1:1 technology implementation.

Student Graduation Rate

To compare the difference in student graduation rates between schools with 1:1 technology and those without, graduation rate data from 2016 were collected and compared statistically using independent-samples t-tests.

For the overall sample, students enrolled in the high schools (*N*=229) that had received the treatment of 1:1 technology (*M*=90.5, *SD*=12.1) had a higher graduation rate than students enrolled in the high schools (*N*=141) that had not received the treatment of 1:1 technology *(M*=85.1, *SD*=21.3). The results of an independent samples t-test indicated that this difference was statistically significant (*p*=.006), suggesting that this difference may have been a result of the 1:1 technology implementation.

When controlled for socio-economic status, students enrolled in the high schools (*N*=173) that were below the state average student free/reduced lunch percentage (*M*=49.3, *SD*=18.6) and had received the treatment of 1:1 technology (*M*=93.2, *SD*=6.91) had a higher graduation rate than students enrolled in the high schools (*N*=85) that had not received the treatment of 1:1 technology(*M*=91.5, *SD*=13.3). The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.18), suggesting that this difference was not likely a result of the 1:1 technology implementation.

Students enrolled in the high schools (*N*=56) that were above the state average student free/reduced lunch percentage (*M*=49.3, *SD*=18.6) and had received the treatment of 1:1 technology *(M*=82.2, *SD*=19.2) had a higher graduation rate than students enrolled in the high schools (*N*=56) that had not received the treatment of 1:1 technology (*M*=75.3, *SD*=26.9). The results of an independent samples t-test indicated that this difference was not statistically significant (*p*=.12), suggesting that this difference was not likely a result of the 1:1 technology implementation.

When controlled for charter school status, students enrolled in charter high schools (N=8) that had received the treatment of 1:1 technology (*M*=70.6, *SD*=30.9) had a higher graduation

rate than students enrolled in the charter high schools (N=20) that had not received the treatment of 1:1 technology (M=45.9, SD=33.6). The results of an independent samples t-test indicated that this difference was not statistically significant (p=.084), suggesting that this difference was not likely a result of the 1:1 technology implementation.

CHAPTER FIVE: CONCLUSIONS

This chapter begins with a summary of the study by reviewing the methodology used and making connections between the review of literature and the major findings of this study. Also, conclusions from data analysis and recommendations for successful implementation and future research are discussed.

Summary of Study

Implementing innovative educational environments for their students is a task faced by all schools. Increased access to information by way of the widely available high-speed Internet, improved wireless networks, and cost-effective mobile devices has led to the widespread implementation of digital tools in the classroom around the globe (Cuban, 2009).

This research explored whether the implementation of 1:1 technology into Indiana High Schools had produced differences in student outcomes in the areas of student academic performance, attendance, and graduation rates.

Research Questions

The research questions that guided this study were:

1. What is the difference in student academic performance between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?

2. What is the difference in student attendance rates between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?

3. What is the difference in student graduation rates between high schools that have implemented 1:1 technology initiatives and high schools that have not implemented 1:1 technology initiatives?

Review of Research Methods

This study was conducted using archival data from several different sources. The 2016 Indiana Technology Planning Survey administered by the Indiana Department of Education was used to identify high schools in Indiana that had implemented 1:1 technology initiatives. This survey identified 375 public high schools that could be compared based on their complete responses to the survey, participation in standardized testing, and comprehensive reporting of student attendance and graduation rates.

Data were collected for the sample high schools to compare the differences in student outcomes between high schools with 1:1 technology and high schools without 1:1 technology. This data collected came from the 2016 ISTEP+ English/Language Arts End-of-Course Assessments, the 2016 ISTEP+ 10 English/Language Assessment, 2016 attendance data, and 2016 graduation data.

To control for socio-economic status the high schools were sorted into two groups. One group contained the high schools that were below the state average student free/reduced lunch percentage. The second group included the high schools that were above the state average student free/reduced lunch percentage. Also, this study controlled for Charter School status when comparing student outcomes between high schools with 1:1 technology and those without.

Statistical analysis was used to draw conclusions from the differences found in student outcomes between high schools with 1:1 technology and those without. The differences in

student outcomes were compared using traditional descriptive statistics and inferential statistics in the form of sixteen different independent samples t-tests.

Findings

The findings of this study include both descriptive and inferential data. Statistical significance was achieved in five of the sixteen independent samples t-tests that were conducted to compare the differences in student outcomes between high schools with 1:1 technology and those without. These findings contribute to answering each of the research questions, to the existing body of knowledge regarding instructional technology, and to suggestions for further research.

Demographics and 1:1 Implementations

Student outcomes data were compared between 375 public high schools in Indiana. These high schools had a combined enrollment of 298,518 students in 2016. Although not directly related to the research questions for this study it is important to point out that high schools with 1:1 technology were more homogenous and had more white students than high schools without 1:1 technology (IDOE). High schools with 1:1 technology reported that 75.6 percent of their students were white compared to high schools without 1:1 technology that had 67.8 white students enrolled. Also, high schools without 1:1 technology had higher percentages of American Indiana, Asian, Black, Hispanic, and Multiracial students. Both high schools with and without 1:1 technology had an equal percentages of Native Hawaiian/Pacific Islander students enrolled.

High schools with 1:1 technology also had a slightly higher percentage of students who did not qualify for free/reduced lunch. High schools with 1:1 technology had 59% of their

students pay for lunch compared to high schools without 1:1 technology that had 58% of their students pay for lunch.

There was virtually no difference in the percentage of students identified as special education between high schools that had implemented 1:1 technology and those that had not. High schools with 1:1 technology had 13.9% of their students receiving special education services compared to high schools without 1:1 technology that had 13.7% of their students receiving services.

High schools with 1:1 technology also had a slightly lower percentage of English Language Learners (ELL). High schools with 1:1 technology had 2.65% of their students identified as English Language Learnings compared to high schools without 1:1 technology which had 3.12% of their students identified as English Language Learners.

The demographics of the sample schools indicate that other than ethnicity, there is very little difference between schools that have implemented 1:1 technology and those that have not. This is important to consider when drawing conclusions regarding the differences in student outcomes and 1:1 technology implementations particularly for the overall sample of schools.

Student Academic Achievement (Research Question 1)

Research question one sought to determine if there was a difference in student academic performance between high schools with 1:1 technology and those without. The findings of the study indicated that differences existed in student academic performance between high schools with 1:1 technology and schools without 1:1 technology for all sample groups. However those differences for the overall sample, the high schools above the state free/reduced lunch average sample, and the charter high school sample were not statistically significant for either of the

standardized assessments used for comparison in this study. Previous research did not support these findings and have reported that 1:1 technology had improved student academic outcomes. Specifically, students who were exposed to 1:1 technology significantly increased their writing performance, literacy skills, and spelling skills (Bebell & Kay, 2010; Grimes, & Warschauer, 2010; Lowther, Ross, & Morrison, 2003; Silvernail & Gritter, 2007; Suhr el at., 2011). These results also do not support previous research focused on academic performance of students with low socio-economic status and 1:1 technology. These studies have suggested that immersion in a 1:1 technology program had resulted in the achievement gap on standardized English/Language Arts assessments being reduced between low socio-economic students and their peers (Kay, 2010). Zheng et al.'s (2013) study of elementary school 1:1 programs in Colorado and California also found that low-income and Hispanic students in each district improved their writing test scores more than their more affluent classmates (Zheng et al., 2013).

However, the findings did indicate a statistically significant difference in student academic outcomes in high schools that were below the state free/reduced lunch average for one of the standardized assessments. Specifically, students who were enrolled in high schools without 1:1 technology and were wealthier than the state average performed better than students enrolled in schools that did have 1:1 technology on the ISTEP+ End of Course English/Language Arts Assessment. This suggests that academic performance in Language Arts for students with a higher socio-economic status may not be influenced by 1:1 technology. This result is not supported by any other research because prior studies have focused on 1:1 technology and the academic performance of students with a low socio-economic status instead of wealthy students (Kay, 2010; Bebell & Kay, 2010). It is interesting to point out that previous studies have also

indicated that teachers and students from advantaged schools are usually more technologically savvy, allowing them to focus on teaching and learning opportunities that maximize the educational benefits of the 1:1 technology instead of focusing on basic technology skills (Rousseau, 2007).

It is possible that this finding is a result of the sampling and school identification process used for this study. Responses from the 2016 Indiana Technology Plan survey were used to identify schools that had implemented 1:1 technology. Schools that identified as not having 1:1 technology or having a "Bring Your Own Device" (BYOD) program were not included in the sample of schools that had implemented 1:1 technology. Several Indiana high schools that are both academically high performing and have a high socio-economic status responded to the survey as either not having 1:1technology or having a BYOD program. This could account for why the findings indicated financially advantaged students without 1:1 technology performed better than financially advantaged students with 1:1 technology. It is possible that the students considered by this study to have limited exposure to technology may actually have the same level of exposure to technology, but did not have devices provided to them by their schools.

When considering this possibility along with the other findings, this study suggests that the implementation of 1:1 technology into public high schools Indiana may have no impact on student performance on standardized English/Language Arts assessments.

Student Attendance Rate (Research Question 2)

Research question two sought to determine if there was a difference in student attendance rates between high schools with 1:1 technology and those without. The findings of the study indicated that differences existed in student attendance rates between high schools with 1:1

technology and high schools without 1:1 technology for all sample groups. Students enrolled in high schools with 1:1 technology had higher attendance rates than students enrolled in high schools without 1:1 technology. The study indicated that differences in student attendance rate for the overall sample, the high schools above the state/free reduced lunch average sample, and the charter high school sample were statistically significant. The results of this study support the findings from previous studies which found positive associations between implementing 1:1 technology and improved school attendance. Lane (2003) reported that with the implementation of laptops, not only did student engagement increase but that student attendance rates increased as well. An increase in student attendance as a result of 1:1 technology implemenation has been demonstrated in several other studies. (Downes & Bishop, 2015; Shapley et al., 2009; Storz & Hoffman, 2013; Warschauer & Grimes, 2005).

However, the findings did not indicate a statistically significant difference in student attendance rate between high schools with or without 1:1 technology that were below the state average student free/reduced lunch percentage. This suggests that school attendance for wealthy students may not be influenced by 1:1 technology implementation. This result is not supported by any other research because prior studies have focused on 1:1 technology and the outcomes of students with a low socio-economic status and not wealthy students (Kay, 2010; Bebell & Kay, 2010).

There are several possibilities that may explain why student attendance rates are better for schools with 1:1 technology. Schools that implemented 1:1 technology typically also improve their technology infrastructure and increase student access to free high-speed internet.

Students, particularly those with low socio-economic status, may be more motivated to attend school on a regular basis to access the free internet which they may otherwise not have access to.

Also, schools with 1:1 technology have flexibility and various other options available to them regarding student attendance that schools without 1:1 technology don't have. This study did not control for or consider how schools record attendance. Schools with 1:1 technology may count students present at school even if they are not physically at school as long as they are enrolled and participating in a digital curriculum. Schools located in rural areas may use E-Learning days to count students present on days when weather conditions makes it impossible to attend school in the physical school building.

Previous studies have revealed that students are more engaged in their learning in 1:1 technology environments (Amelink, 2012; Bebell & Kay, 2010; Downes & Bishop, 2015; Shapely et al., 2006, 2007, 2009, 2010; Suhr et al., p.24, 2010). It is possible that students who are engaged in and generally enjoy their learning are more likely to attend school on a regular basis. When considering these possibility, this study suggests that schools trying to improve their student attendance rates should consider implementing a 1:1 technology environment.

Student Graduation Rate (Research Question 3)

Research question three sought to determine if there was a difference in student graduation rates between high schools with 1:1 technology and those without. The findings of the study indicate that differences existed in student graduation rates between high schools with 1:1 technology and high schools without 1:1 technology for all sample groups. Students enrolled in high schools with 1:1 technology had higher graduate rates than students enrolled in high schools without 1:1 technology. The study indicated that the difference in student graduation

rates for the overall sample was statistically significant. Previous studies have not directly focused on student graduation rates and 1:1 technology implementation. However, several of the studies did report that 1:1 technology had an impact on student engagement and discipline which previous research suggests can be directly related to graduation rates (Balfanz, Byrnes & Fox, 2015). The findings from this study also confirmed previous findings that create a link between 1:1 technology and improved student engagement in the classroom (Amelink, 2012; Bebell & Kay, 2010; Downes & Bishop, 2015; Shapely et al., 2006, 2007, 2009, 2010; Suhr et al., p.24, 2010). Also, studies reported both positive and negative results regarding student discipline (Swallow 2015). Teachers and students reported improved overall behavior with students being less disruptive and classrooms being more orderly and quite (Storz & Hoffman, 2013). However, teachers also reported that classroom management had become much more difficult with the addition of 1:1 technology (Donovan, Green, & Hartley, 2011). The findings did not indicate a statistically significant difference in student graduation rates between high schools with or without 1:1 technology when controlled for socio-economic status or charter school status.

Previous studies have found a relationship between student graduation rates and student attendance rates. Generally speaking, schools that have better student attendance rates also have better graduation rates (Moussa, 2017). This study suggests that schools with 1:1 technology have better student attendance and graduation rates. It is possible that the improved graduation rates suggested by this study may actually be a result of the improved attendance rates associated with 1:1 technology implementation. When considering this possibility, this study suggests that

schools trying to improve their student graduation rates should consider implementation of 1:1 technology.

Recommendations for Practice

This study suggests that only implementing 1:1 technology into a high school may not have the desired positive impact on student academic performance. This may partially be a result of stakeholders only focusing on the technology implementation and not on how the technology is being used (Mishra & Koehler, 2006). Stakeholders considering implementing 1:1 technology into their schools should also consider adopting a formal system to guide and evaluate how the technology is used in the classroom. Frameworks such as TPACK and the SAMIR Model could provide stakeholders with a blueprint on how to properly use technology in the classroom in order to create optimal learning experiences. It is important to remember that technology is only a tool that's effectiveness is dependent upon the quality of its application.

Limitations

There are five potential limitations of this study. First, the data found on the Indiana Technology Plan Survey that were used to identify schools that had implemented 1:1 technology were collected through self-reported data. The reported 1:1 technology data is assumed to be accurate and appropriately identifying and categorizing schools, however. Secondly, schools across Indiana have implemented 1:1 technology learning environments differently and as a result, there may not be two implementations that are the same. Thirdly, there may be other variables that could have an impact on student outcomes, such as student maturity level, exposure to quality learning experiences, items related to the culture and climate of the individual schools, and other unidentified variables that could not be controlled for. A fourth

limitation of this study was that it only utilized data from public high schools in Indiana. Private schools in Indiana are not required to complete surveys or participate in state assessments. Therefore, it was not possible to collect the necessary data for this study from those schools. Finally, according to Downes & Bishop (2015), One of the great challenges with research on 1:1

> programs, in particular, is that 1:1 computing, by definition, signifies the level at which access to technology is available to students. It declares nothing about actual educational practices. One-to-one programs are, therefore, problematic to study and compare, as they describe the ratio of technology access, not necessarily how that technology is being used to promote learning (p. 2).

Recommendations for Further Research

This study was conducted to add to the growing body of knowledge on the impact that 1:1 technology may have on high school student outcomes. The key stakeholders for this study may find the results of this study to be valuable as 1:1 implementations continue to increase. This study was limited in scope by only examining the differences in student outcomes between public high schools with 1:1 technology and public high schools without 1:1 technology. As a result, further research is needed to gain a deeper understanding of the differences in student outcomes between high schools with 1:1 technology and those without. Because the findings from this study suggests that 1:1 technology may not have a positive impact on student academic achievement on English/Language Arts standardized assessments, further research is needed to explore why this may be. Also, research is needed to explore why both attendance rates and graduation rates may be better for students enrolled in schools that have implemented 1:1 technology. Possible reasons for the results of this study have provided but have not been

confirmed by research. This study could be replicated in the future to draw conclusions regarding student outcomes and 1:1 technology as more schools implement 1:1 technology into their learning environments and schools currently with 1:1 technology have more time to improve their implementations.

Future research topics not directly related to this study, such as exploring instructional practices, professional development, and length of exposure time for both students and teachers, and teacher and administrator perceptions and attitudes toward technology, would also contribute to the body of knowledge regarding 1:1 technology implementation. All of these potential research topics focus on exploring different variables that may have a significant impact on student outcomes and technology implementation.

Conclusion

Since the early 1980's, there has been a loosely formed national coalition of public officials, corporate executives, vendors, policymakers, educators, and parents that share the same common goal of creating access to new technologies in schools for various reasons (Cuban, 2009). In 2017, 271 school districts in Indiana had implemented some form of 1:1 technology (IDOE, 2017). In some school districts, spending on devices and infrastructure can top several hundreds of thousands of dollars (Shumski, 2014). The purpose of this study was to identify, analyze, and compare differences in student outcomes between public high schools in Indiana that had implemented 1:1 technology and those that had not. This study may serve as a resource for policymakers and education leaders as they make decisions related to ubiquitous technology implementation. With a better understanding of student outcomes, school leaders should be

better equipped to make and defend decisions associated with integrating 1:1 technologies into the schools which that they are responsible for leading.

This study was successful in identifying and comparing the differences in student outcomes between high schools with 1:1 technology and high schools without 1:1 technology. It suggests that only implementing 1:1 technology into a high school may not have a significant positive impact on student academic performance, particularly on English/Language Arts standardized tests and may have a negative impact on wealthy students. This is not surprising since other research has confirmed that 1:1 technology alone many not make much of a difference in improving academic performance on standardized tests. Silvernail (2005) believes that one explanation for this is that the skills promoted in laptop programs such as critical thinking, research skills, and in-depth analysis are not evaluated by the kind of questions found on most standardized tests.

The most significant finding of this study is the suggestion that implementing 1:1 technology into a high school may have a positive impact on both student attendance and graduation rates. Schools exploring ways to increase student engagement and improving their student attendance rates and graduation rates should consider implementing 1:1 technology into their schools regardless of the socio-economic status of the students enrolled.

Many of the differences in student outcomes found between the high schools with 1:1 technology and without 1:1 technology were supported by previous research conducted around the world. With a better understanding of the differences in student outcomes between high schools with 1:1 technology and those without, stakeholders can make better informed decisions regarding technology implementation and best practice and researchers can begin to focus on

why the differences in student outcomes exist between schools with 1:1 technology and schools without.

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APPENDIX A

OVERALL SAMPLE STUDENT OUTCOME DATA

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
1	Y	80.00	29.63	96.88	98.85
2	Y	100.00	68.24	96.27	90.12
3	Y	78.91	75.34	95.09	88.77
4	Y	89.82	80.15	97.04	96.61
5	Y	87.78	72.48	95.91	94.89
6	Y	55.26	50.00	95.06	92.35
7	N	88.43	76.65	96.18	96.68
8	N	59.31	43.75	94.44	82.25
9	N	69.87	54.93	94.98	93.03
10	N	47.44	38.06	92.52	84.69
11	N	56.49	43.59	93.83	92.12
12	N	70.62	56.09	95.73	92.27
13	Y	68.42	54.89	95.30	87.83
14	Y	49.58	39.00	92.89	87.39
15	Y	81.94	78.87	96.80	100.00
16	Y	73.63	67.79	95.69	90.09
17	Y	64.21	52.23	96.00	89.86
18	Y	75.64	57.14	96.47	100.00
19	Y	78.52	56.76	96.61	93.69
20	N	50.00	55.56	95.21	91.91
21	N	94.62	77.85	96.35	97.80
22	Y	75.36	65.93	96.08	95.80
23	Y	81.74	62.92	94.90	93.42
24	N	83.73	50.30	95.72	99.31
25	Y	81.93	62.65	96.23	94.92
26	Y	77.00	55.43	93.98	89.72
27	Y	85.33	59.46	96.27	88.73
28	Y	80.00	50.48	96.28	96.92
29	Y	61.79	60.54	95.64	94.24
30	N	76.14	54.02	95.35	91.86
31	Y	67.86	50.00	96.02	91.30
32	N	71.00	61.06	94.87	91.94
33	Y	82.00	79.59	95.77	91.67
34	N	83.02	64.71	98.31	95.00
35	Y	80.11	64.41	93.79	92.31
36	Y	54.69	46.88	94.99	96.74
37	Y	60.41	57.22	92.09	90.23

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
38	Y	81.97	76.19	94.78	94.83
39	Y	59.66	43.36	94.40	92.38
40	Y	71.88	61.29	93.99	97.33
41	N	79.71	64.18	96.80	95.65
42	N	50.00	36.06	93.56	91.81
43	Y	73.87	69.30	94.13	86.00
44	N	97.56	87.80	97.38	95.65
45	Y	81.58	67.95	96.59	93.06
46	N	90.91	57.06	95.21	95.78
47	Y	79.87	52.90	95.94	97.26
48	Y	86.49	40.50	95.04	89.29
49	Y	72.37	56.58	94.59	98.53
50	Y	77.11	49.41	95.37	90.00
51	Y	69.38	52.20	95.91	99.29
52	Y	68.29	36.14	95.18	94.66
53	Y	68.75	55.80	95.99	97.12
54	Y	72.28	54.41	95.80	89.78
55	N	82.65	56.50	94.95	94.27
56	Y	84.81	63.64	92.68	98.65
57	Y	82.29	61.05	95.69	98.73
58	N	79.03	53.23	96.86	93.62
59	Y	81.95	72.60	95.99	98.11
60	N	85.29	68.18	96.04	98.33
61	Y	53.69	41.60	94.14	92.24
62	Y	96.00	82.69	96.33	97.50
63	N	83.78	69.23	95.89	90.91
64	N	65.00	41.98	96.48	78.13
65	Y	84.93	65.33	96.63	90.14
66	Y	82.52	69.61	97.88	97.17
67	N	70.40	58.06	96.09	92.13
68	Y	77.53	74.63	97.51	96.15
69	N	78.26	68.61	95.47	92.65
70	Y	62.68	49.30	93.68	95.04
71	N	67.47	45.82	93.71	89.76
72	Y	78.32	63.58	95.18	92.11
73	N	88.28	74.40	95.97	91.51
74	N	57.51	45.22	90.97	90.17
75	N	58.68	54.29	92.23	87.41
76	N	15.38	17.31	92.41	
77	Y	58.87	46.53	93.72	88.13
78	Y	71.43	58.94	94.45	90.84

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
79	Y	74.03	59.74	95.22	94.29
80	N	74.16	53.41	95.22	93.94
81	Y	65.31	35.42	95.36	93.44
82	Y	70.70	55.05	94.77	91.76
83	Y	75.36	63.24	94.63	88.71
84	Y	73.91	51.11	93.28	97.01
85	Y	84.28	63.46	96.23	91.18
86	Y	67.83	48.95	94.51	87.80
87	Y	74.59	65.57	96.77	97.69
88	Y	79.61	58.42	94.44	95.83
89	Y	63.21	55.24	95.07	96.49
90	N	61.57	48.73	92.74	97.01
91	N	82.93	68.29	94.80	96.92
92	Y	73.53	57.58	94.93	90.77
93	N	73.40	58.06	94.84	88.89
94	N	72.55	51.96	93.79	97.59
95	N	68.75	52.08	96.49	93.75
96	Y	78.75	58.02	96.35	90.48
97	Y	74.12	62.86	95.77	95.57
98	N	86.47	82.15	96.01	95.66
99	N	86.81	60.38	97.05	97.48
100	N	89.12	79.38	96.25	96.78
101	N	90.53	86.15	96.07	96.47
102	Y	83.17	63.40	96.07	95.35
103	N	46.15	36.36	98.35	35.90
104	Y	58.82	35.00	99.09	53.33
105	N	61.54	16.67	97.63	22.22
106	Y	78.97	67.79	95.49	96.92
107	Y	71.94	58.70	96.03	94.90
108	Y	80.36	65.18	95.93	93.26
109	Y	82.97	59.52	95.29	90.96
110	Y	87.10	62.30	96.23	98.28
111	N	80.11	67.98	95.14	95.27
112	Y	80.56	70.56	94.28	92.57
113	Y	66.07	61.11	95.53	91.30
114	N	82.99	76.67	96.34	98.93
115	Y	83.33	70.29	97.00	95.05
116	Y	82.34	63.99	96.16	98.03
117	Y	67.39	45.83	95.24	88.24
118	N	77.00	73.96	95.47	95.35
119	Y	80.25	67.38	96.42	95.31

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
120	N	82.42	50.00	95.16	96.15
121	Y	69.23	54.31	93.75	82.35
122	Y	84.50	77.52	96.76	97.20
123	Y	82.76	60.34	96.47	98.86
124	Y	80.10	74.63	94.27	96.34
125	N	69.23		87.16	31.90
126	Y	58.54	48.26	94.23	82.41
127	Y	73.30	67.72	95.75	91.23
128	N	50.00	55.00	94.62	92.86
129	Y	60.00	51.72	97.83	90.00
130	N	86.61	59.15	96.66	97.16
131	Y	60.68	54.69	95.31	93.88
132	Y	74.25	57.41	95.57	94.63
133	Y	83.97	70.23	95.22	95.69
134	N	72.50	47.79	92.22	93.98
135	Y	66.24	52.81	94.21	89.91
136	Y	72.29	55.42	94.86	93.83
137	N	65.51	58.62	94.25	94.23
138	Y	75.15	54.55	95.15	95.16
139	N	76.32	69.25	96.04	93.76
140	Y	85.60	67.34	95.95	94.63
141	Y	72.26	47.15	95.24	94.52
142	Y	72.58	62.90	92.39	95.59
143	N	79.17	74.76	96.18	91.05
144	N	79.27	56.25	95.41	97.40
145	N	44.44	51.02	96.40	100.00
146	Y	70.10	56.61	94.61	97.02
147	Y	69.06	48.03	94.00	95.27
148	Y	73.53	38.57	93.57	87.95
149	Y	71.62	62.31	95.30	92.64
150	N	78.00	63.27	96.08	94.83
151	Y	83.49	59.63	96.80	96.00
152	Y	69.12	45.32	94.05	85.06
153	N	87.57	71.91	97.99	95.51
154	N	51.43	33.02	95.85	75.24
155	N	37.50	45.34	96.37	87.55
156	N	84.03	72.95	94.92	95.51
157	Y	66.42	59.08	95.05	98.11
158	Y	42.86	35.58	96.68	96.45
159	Y	85.31	75.47	94.87	96.13
160	Y	39.03	33.33	91.34	73.30

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
161	N	65.38	44.55	87.49	91.67
162	N	30.00	6.82	93.92	71.43
163	N	56.13	44.44	94.18	98.08
164	N	22.22	21.80	84.83	87.20
165	N	67.50	55.42	95.10	95.65
166	N	69.10	64.09	96.88	95.74
167	N	84.79	54.68	95.62	92.86
168	Y	80.00	72.27	94.00	94.07
169	Y	90.56	87.69	98.29	97.09
170	N	78.35	60.64	95.72	91.84
171	N	50.00	41.36	94.42	79.56
172	N	65.12	44.89	95.23	88.20
173	N	37.89	23.56	93.35	79.81
174	N	53.04	38.00	95.41	82.46
175	Y	67.21	50.82	93.62	95.38
176	Y	73.31	53.02	97.38	94.53
177	Y	71.43	50.00	95.37	100.00
178	N	62.82	46.05	93.38	93.18
179	N	89.19	66.22	96.80	98.53
180	N	66.57	52.85	92.67	88.35
181	N	60.00		82.12	25.36
182	N	71.63	50.73	93.16	85.87
183	N	77.57	53.64	95.14	82.58
184	N	59.36	42.86	93.58	94.83
185	Y	72.64	60.00	94.58	96.40
186	Y	77.27	64.62	95.52	95.69
187	Y	78.52	58.65	95.93	95.73
188	N	80.60	62.84	96.19	92.74
189	Y	92.98	61.02	95.45	89.83
190	Y	61.20	46.94	94.55	90.88
191	Y	50.00	31.71	80.49	50.47
192	Y	33.33	0.00	94.31	29.41
193	N	84.54	68.86	95.71	96.92
194	Y	46.09	34.34	92.47	87.15
195	Y	74.00	51.02	95.41	91.43
196	Y	59.50	45.45	93.49	92.33
197	Y	61.27	51.80	94.20	92.46
198	Y	86.67	66.67	55.88	31.94
199	Y	53.17	31.30	97.98	22.68
200	Y	65.03	49.26	96.64	91.94
201	Y	59.02	49.19	96.52	94.12

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
202	N	57.51	51.48	95.56	93.15
203	Y	53.80	48.02	95.05	87.77
204	Y	70.63	56.34	95.24	100.00
205	Y	72.05	58.95	93.29	87.12
206	N	71.69	60.32	94.87	88.51
207	Y	29.17	23.81	92.57	74.51
208	Y	40.63	31.04	86.53	74.11
209	Y	37.50	29.22	94.96	97.17
210	Y	60.66	52.07	93.78	88.79
211	N	39.39	17.09	78.23	82.65
212	Y	24.55	16.11	92.26	73.03
213	Y	23.08	20.37	86.14	63.37
214	Y	40.00	48.78	93.29	98.25
215	N	57.14		68.17	18.67
216	Y	35.56	17.81	80.55	63.01
217	Y	25.25	23.53	85.20	65.38
218	N	41.67	24.07	84.37	62.00
219	N	40.54		84.62	22.65
220	N	92.11	85.42	96.30	98.90
221	N	76.92		82.78	25.00
222	N	40.00		79.72	9.59
223	Y	71.88	65.71	95.78	85.00
224	N	58.33	41.53	94.92	94.38
225	N	47.83		85.38	29.33
226	N	88.73	58.90	96.04	90.48
227	Y	82.61	55.56	95.24	79.17
228	Y	75.29	65.09	96.48	89.57
229	Y	69.47	58.87	94.72	86.45
230	Y	50.00	21.74	87.93	
231	Y	0.00	0.00	88.47	
232	Y	40.00	35.00	88.00	
233	N	80.56	36.11	93.55	88.89
234	N	81.97	68.85	97.14	94.87
235	Y	79.89	68.57	95.99	93.39
236	Y	76.32	54.67	95.56	91.53
237	Y	80.53	61.06	94.88	93.97
238	Y	35.29	49.44	96.38	97.92
239	Y	77.18	65.35	95.72	92.06
240	Y	86.42	82.59	95.05	96.92
241	Y	78.72	71.16	94.30	96.86
242	Y	88.89	88.89	95.31	100.00

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
243	N	82.28	84.15	97.36	88.89
244	Y	40.00	9.09	84.37	35.29
245	Y	20.00	58.90	93.43	98.04
246	Y	83.33	55.56	96.01	96.38
247	N	25.81	52.73	95.03	96.62
248	N	74.58	49.57	95.08	90.76
249	N	64.52	43.33	94.15	100.00
250	N	69.25	55.68	94.79	94.29
251	Y	73.99	64.94	95.31	93.20
252	Y	72.65	61.61	94.23	94.90
253	Y	75.00	54.17	95.12	91.67
254	Y	56.52	43.48	95.81	94.44
255	Y	56.40	50.70	94.48	88.11
256	Y	34.88	39.88	93.78	93.46
257	Y	89.19	73.68	96.59	90.48
258	Y	70.00	61.67	95.46	96.67
259	Y	66.98	42.74	96.66	81.71
260	Y	75.38	63.77	96.93	94.83
261	N	67.20	41.80	96.34	89.30
262	N	52.86	28.36	95.41	84.34
263	N	74.19	61.90	94.05	98.21
264	N	77.55	64.58	94.22	100.00
265	Y	73.24	65.38	95.71	98.78
266	Y	77.08	62.77	94.45	96.34
267	N	76.19	54.42	95.82	89.31
268	Y	85.37	67.90	95.84	95.40
269	Y	94.92	71.19	98.39	100.00
270	Y	94.12	76.47	98.14	94.83
271	Y	83.04	79.13	95.25	96.95
272	N	76.58	53.33	96.21	98.63
273	Y	90.91	88.31	96.48	97.18
274	N	34.62	18.75	76.76	33.00
275	N	86.27	60.82	93.14	94.48
276	N	81.58	68.13	93.62	95.93
277	Y	73.94	60.37	96.86	97.04
278	N	83.61	75.41	98.13	91.59
279	Y	73.40	42.11	95.66	93.07
280	Y	63.27	44.62	93.81	86.21
281	N	68.42	47.71	95.44	92.66
282	N	82.14	65.06	96.15	96.34
283	N	70.00	42.16	95.69	96.19

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
284	Y	66.44	43.92	95.84	92.97
285	Y	73.33	45.16	95.22	66.67
286	Y	78.26	59.57	97.10	100.00
287	Y	72.07	44.14	94.74	95.51
288	Y	73.91	68.48	94.89	96.30
289	Y	70.59	56.72	95.95	94.92
290	Y	74.73	64.13	95.15	94.95
291	Y	79.03	59.38	95.53	89.83
292	Y	71.43	60.20	97.05	95.45
293	N	80.82	67.94	95.86	95.13
294	Y	84.48	69.77	96.45	97.97
295	N	74.29	61.27	95.10	95.40
296	Y	46.67	75.78	97.06	97.63
297	Y	75.00	59.26	95.02	85.51
298	N	52.94	38.33	92.64	89.59
299	Y	73.19	63.70	94.90	92.94
300	N	60.67	54.13	94.88	91.47
301	N	67.94	59.71	91.99	92.14
302	N	55.60	43.87	90.54	84.53
303	N	37.50	23.27	87.01	85.31
304	N	61.76	49.23	93.89	
305	N	80.00		73.38	0.00
306	Y	67.05	50.57	95.37	89.53
307	Y	70.16	47.47	95.53	83.51
308	Y	77.55	54.00	94.37	91.43
309	Y	78.95	58.97	96.44	90.48
310	Y	72.22	59.20	96.16	96.49
311	Y	82.98	80.85	96.43	100.00
312	N	68.87	60.31	96.19	93.55
313	Y	81.71	72.73	96.10	100.00
314	Y	75.00	54.44	94.34	88.35
315	Y	73.33	54.35	93.35	77.78
316	Y	73.33	64.24	96.82	88.89
317	N	52.50	32.05	93.06	91.46
318	N	87.50	66.22	93.39	84.81
319	Y	80.00	45.00	95.87	80.95
320	Y	73.43	58.74	95.57	87.26
321	Y	75.76	47.62	96.24	89.33
322	N	79.41	36.36	92.00	69.57
323	Y	76.39	57.34	95.10	95.65
324	Y	70.00	54.00	94.48	94.02

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
325	Y	70.91	53.32	95.76	92.08
326	N	17.65	7.14	91.24	81.82
327	Y	77.92	68.09	96.20	94.26
328	N	53.93	47.01	94.80	88.56
329	N	85.71		73.90	26.85
330	N	94.97	84.81	96.59	100.00
331	N	73.53	45.59	93.99	97.18
332	Y	59.32	52.31	95.34	97.67
333	Y	54.14	45.60	96.54	88.49
334	Y	70.04	60.47	97.65	94.34
335	Y	73.52	57.37	98.02	92.44
336	Y	70.09	61.82	97.23	93.75
337	Y	24.69	18.09	83.50	19.93
338	N	100.00	98.72	97.51	100.00
339	Y	62.50	59.34	97.20	87.50
340	Y	76.00	70.67	97.28	98.33
341	Y	67.74	40.00	93.82	88.00
342	Y	78.29	64.84	93.65	97.17
343	N	84.06	60.00	93.21	92.04
344	N	64.06	46.22	93.57	92.74
345	N	85.16	59.66	93.38	92.25
346	N	100.00	30.00	81.73	78.57
347	N	20.00	5.88	79.75	44.83
348	Y	67.21	57.38	94.82	95.50
349	Y	57.47	44.19	96.41	91.67
350	Y	81.71	67.90	96.01	97.06
351	Y	29.41	12.50	98.64	53.66
352	Y	65.38	57.14	94.40	94.17
353	Y	82.29	67.71	95.58	97.70
354	N	73.86	51.72	93.89	87.93
355	N	70.89	54.67	94.86	82.16
356	N	83.65	69.18	95.96	88.72
357	N	69.40	56.82	95.46	94.74
358	Y	75.00	70.91	95.28	98.72
359	N	77.57	65.74	94.95	91.67
360	Y	75.00	50.53	95.60	95.83
361	Y	60.26	36.14	93.77	86.42
362	Y	75.19	58.78	95.93	94.17
363	Y	71.62	62.16	97.11	95.89
364	Y	61.64	49.53	93.94	95.74
365	N	75.00		88.85	21.05

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
366	Y	77.19	67.27	96.13	92.31
367	Y	79.78	65.12	95.85	95.59
368	Y	50.00	68.63	95.62	98.18
369	Y	53.42	50.68	94.20	86.00
370	Y	81.82	63.64	96.78	93.33
371	Y	73.02	63.93	95.89	84.31
372	Y	79.17	42.49	95.81	91.03
373	N	77.96	65.84	95.88	95.06
374	Y	70.37	56.60	95.25	92.44
375	N	81.71	56.63	95.78	96.04

APPENDIX B

SCHOOLS WITH 1:1 TECHNOLOGY SAMPLE STUDENT OUTCOME DATA

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
1	Y	80.00	29.63	96.88	98.85
2	Y	100.00	68.24	96.27	90.12
3	Y	78.91	75.34	95.09	88.77
4	Y	89.82	80.15	97.04	96.61
5	Y	87.78	72.48	95.91	94.89
6	Y	55.26	50.00	95.06	92.35
13	Y	68.42	54.89	95.30	87.83
14	Y	49.58	39.00	92.89	87.39
15	Y	81.94	78.87	96.80	100.00
16	Y	73.63	67.79	95.69	90.09
17	Y	64.21	52.23	96.00	89.86
18	Y	75.64	57.14	96.47	100.00
19	Y	78.52	56.76	96.61	93.69
22	Y	75.36	65.93	96.08	95.80
23	Y	81.74	62.92	94.90	93.42
25	Y	81.93	62.65	96.23	94.92
26	Y	77.00	55.43	93.98	89.72
27	Y	85.33	59.46	96.27	88.73
28	Y	80.00	50.48	96.28	96.92
29	Y	61.79	60.54	95.64	94.24
31	Y	67.86	50.00	96.02	91.30
33	Y	82.00	79.59	95.77	91.67
35	Y	80.11	64.41	93.79	92.31
36	Y	54.69	46.88	94.99	96.74
37	Y	60.41	57.22	92.09	90.23
38	Y	81.97	76.19	94.78	94.83
39	Y	59.66	43.36	94.40	92.38
40	Y	71.88	61.29	93.99	97.33
43	Y	73.87	69.30	94.13	86.00
45	Y	81.58	67.95	96.59	93.06
47	Y	79.87	52.90	95.94	97.26
48	Y	86.49	40.50	95.04	89.29
49	Y	72.37	56.58	94.59	98.53
50	Y	77.11	49.41	95.37	90.00
51	Y	69.38	52.20	95.91	99.29
52	Y	68.29	36.14	95.18	94.66
53	Y	68.75	55.80	95.99	97.12
54	Y	72.28	54.41	95.80	89.78

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
56	Y	84.81	63.64	92.68	98.65
57	Y	82.29	61.05	95.69	98.73
59	Y	81.95	72.60	95.99	98.11
61	Y	53.69	41.60	94.14	92.24
62	Y	96.00	82.69	96.33	97.50
65	Y	84.93	65.33	96.63	90.14
66	Y	82.52	69.61	97.88	97.17
68	Y	77.53	74.63	97.51	96.15
70	Y	62.68	49.30	93.68	95.04
72	Y	78.32	63.58	95.18	92.11
77	Y	58.87	46.53	93.72	88.13
78	Y	71.43	58.94	94.45	90.84
79	Y	74.03	59.74	95.22	94.29
81	Y	65.31	35.42	95.36	93.44
82	Y	70.70	55.05	94.77	91.76
83	Y	75.36	63.24	94.63	88.71
84	Y	73.91	51.11	93.28	97.01
85	Y	84.28	63.46	96.23	91.18
86	Y	67.83	48.95	94.51	87.80
87	Y	74.59	65.57	96.77	97.69
88	Y	79.61	58.42	94.44	95.83
89	Y	63.21	55.24	95.07	96.49
92	Y	73.53	57.58	94.93	90.77
96	Y	78.75	58.02	96.35	90.48
97	Y	74.12	62.86	95.77	95.57
102	Y	83.17	63.40	96.07	95.35
104	Y	58.82	35.00	99.09	53.33
106	Y	78.97	67.79	95.49	96.92
107	Y	71.94	58.70	96.03	94.90
108	Y	80.36	65.18	95.93	93.26
109	Y	82.97	59.52	95.29	90.96
110	Y	87.10	62.30	96.23	98.28
112	Y	80.56	70.56	94.28	92.57
113	Y	66.07	61.11	95.53	91.30
115	Y	83.33	70.29	97.00	95.05
116	Y	82.34	63.99	96.16	98.03
117	Y	67.39	45.83	95.24	88.24
119	Y	80.25	67.38	96.42	95.31
121	Y	69.23	54.31	93.75	82.35
122	Y	84.50	77.52	96.76	97.20
123	Y	82.76	60.34	96.47	98.86
124	Y	80.10	74.63	94.27	96.34

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
126	Y	58.54	48.26	94.23	82.41
127	Y	73.30	67.72	95.75	91.23
129	Y	60.00	51.72	97.83	90.00
131	Y	60.68	54.69	95.31	93.88
132	Y	74.25	57.41	95.57	94.63
133	Y	83.97	70.23	95.22	95.69
135	Y	66.24	52.81	94.21	89.91
136	Y	72.29	55.42	94.86	93.83
138	Y	75.15	54.55	95.15	95.16
140	Y	85.60	67.34	95.95	94.63
141	Y	72.26	47.15	95.24	94.52
142	Y	72.58	62.90	92.39	95.59
146	Y	70.10	56.61	94.61	97.02
147	Y	69.06	48.03	94.00	95.27
148	Y	73.53	38.57	93.57	87.95
149	Y	71.62	62.31	95.30	92.64
151	Y	83.49	59.63	96.80	96.00
152	Y	69.12	45.32	94.05	85.06
157	Y	66.42	59.08	95.05	98.11
158	Y	42.86	35.58	96.68	96.45
159	Y	85.31	75.47	94.87	96.13
160	Y	39.03	33.33	91.34	73.30
168	Y	80.00	72.27	94.00	94.07
169	Y	90.56	87.69	98.29	97.09
175	Y	67.21	50.82	93.62	95.38
176	Y	73.31	53.02	97.38	94.53
177	Y	71.43	50.00	95.37	100.00
185	Y	72.64	60.00	94.58	96.40
186	Y	77.27	64.62	95.52	95.69
187	Y	78.52	58.65	95.93	95.73
189	Y	92.98	61.02	95.45	89.83
190	Y	61.20	46.94	94.55	90.88
191	Y	50.00	31.71	80.49	50.47
192	Y	33.33	0.00	94.31	29.41
194	Y	46.09	34.34	92.47	87.15
195	Y	74.00	51.02	95.41	91.43
196	Y	59.50	45.45	93.49	92.33
197	Y	61.27	51.80	94.20	92.46
198	Y	86.67	66.67	55.88	31.94
199	Y	53.17	31.30	97.98	22.68
200	Y	65.03	49.26	96.64	91.94
201	Y	59.02	49.19	96.52	94.12

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
203	Y	53.80	48.02	95.05	87.77
204	Y	70.63	56.34	95.24	100.00
205	Y	72.05	58.95	93.29	87.12
207	Y	29.17	23.81	92.57	74.51
208	Y	40.63	31.04	86.53	74.11
209	Y	37.50	29.22	94.96	97.17
210	Y	60.66	52.07	93.78	88.79
212	Y	24.55	16.11	92.26	73.03
213	Y	23.08	20.37	86.14	63.37
214	Y	40.00	48.78	93.29	98.25
216	Y	35.56	17.81	80.55	63.01
217	Y	25.25	23.53	85.20	65.38
223	Y	71.88	65.71	95.78	85.00
227	Y	82.61	55.56	95.24	79.17
228	Y	75.29	65.09	96.48	89.57
229	Y	69.47	58.87	94.72	86.45
230	Y	50.00	21.74	87.93	
231	Y	0.00	0.00	88.47	
232	Y	40.00	35.00	88.00	
235	Y	79.89	68.57	95.99	93.39
236	Y	76.32	54.67	95.56	91.53
237	Y	80.53	61.06	94.88	93.97
238	Y	35.29	49.44	96.38	97.92
239	Y	77.18	65.35	95.72	92.06
240	Y	86.42	82.59	95.05	96.92
241	Y	78.72	71.16	94.30	96.86
242	Y	88.89	88.89	95.31	100.00
244	Y	40.00	9.09	84.37	35.29
245	Y	20.00	58.90	93.43	98.04
246	Y	83.33	55.56	96.01	96.38
251	Y	73.99	64.94	95.31	93.20
252	Y	72.65	61.61	94.23	94.90
253	Y	75.00	54.17	95.12	91.67
254	Y	56.52	43.48	95.81	94.44
255	Y	56.40	50.70	94.48	88.11
256	Y	34.88	39.88	93.78	93.46
257	Y	89.19	73.68	96.59	90.48
258	Y	70.00	61.67	95.46	96.67
259	Y	66.98	42.74	96.66	81.71
260	Y	75.38	63.77	96.93	94.83
265	Y	73.24	65.38	95.71	98.78
266	Y	77.08	62.77	94.45	96.34

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
268	Y	85.37	67.90	95.84	95.40
269	Y	94.92	71.19	98.39	100.00
270	Y	94.12	76.47	98.14	94.83
271	Y	83.04	79.13	95.25	96.95
273	Y	90.91	88.31	96.48	97.18
277	Y	73.94	60.37	96.86	97.04
279	Y	73.40	42.11	95.66	93.07
280	Y	63.27	44.62	93.81	86.21
284	Y	66.44	43.92	95.84	92.97
285	Y	73.33	45.16	95.22	66.67
286	Y	78.26	59.57	97.10	100.00
287	Y	72.07	44.14	94.74	95.51
288	Y	73.91	68.48	94.89	96.30
289	Y	70.59	56.72	95.95	94.92
290	Y	74.73	64.13	95.15	94.95
291	Y	79.03	59.38	95.53	89.83
292	Y	71.43	60.20	97.05	95.45
294	Y	84.48	69.77	96.45	97.97
296	Y	46.67	75.78	97.06	97.63
297	Y	75.00	59.26	95.02	85.51
299	Y	73.19	63.70	94.90	92.94
306	Y	67.05	50.57	95.37	89.53
307	Y	70.16	47.47	95.53	83.51
308	Y	77.55	54.00	94.37	91.43
309	Y	78.95	58.97	96.44	90.48
310	Y	72.22	59.20	96.16	96.49
311	Y	82.98	80.85	96.43	100.00
313	Y	81.71	72.73	96.10	100.00
314	Y	75.00	54.44	94.34	88.35
315	Y	73.33	54.35	93.35	77.78
316	Y	73.33	64.24	96.82	88.89
319	Y	80.00	45.00	95.87	80.95
320	Y	73.43	58.74	95.57	87.26
321	Y	75.76	47.62	96.24	89.33
323	Y	76.39	57.34	95.10	95.65
324	Y	70.00	54.00	94.48	94.02
325	Y	70.91	53.32	95.76	92.08
327	Y	77.92	68.09	96.20	94.26
332	Y	59.32	52.31	95.34	97.67
333	Y	54.14	45.60	96.54	88.49
334	Y	70.04	60.47	97.65	94.34
335	Y	73.52	57.37	98.02	92.44

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
336	Y	70.09	61.82	97.23	93.75
337	Y	24.69	18.09	83.50	19.93
339	Y	62.50	59.34	97.20	87.50
340	Y	76.00	70.67	97.28	98.33
341	Y	67.74	40.00	93.82	88.00
342	Y	78.29	64.84	93.65	97.17
348	Y	67.21	57.38	94.82	95.50
349	Y	57.47	44.19	96.41	91.67
350	Y	81.71	67.90	96.01	97.06
351	Y	29.41	12.50	98.64	53.66
352	Y	65.38	57.14	94.40	94.17
353	Y	82.29	67.71	95.58	97.70
358	Y	75.00	70.91	95.28	98.72
360	Y	75.00	50.53	95.60	95.83
361	Y	60.26	36.14	93.77	86.42
362	Y	75.19	58.78	95.93	94.17
363	Y	71.62	62.16	97.11	95.89
364	Y	61.64	49.53	93.94	95.74
366	Y	77.19	67.27	96.13	92.31
367	Y	79.78	65.12	95.85	95.59
368	Y	50.00	68.63	95.62	98.18
369	Y	53.42	50.68	94.20	86.00
370	Y	81.82	63.64	96.78	93.33
371	Y	73.02	63.93	95.89	84.31
372	Y	79.17	42.49	95.81	91.03
374	Y	70.37	56.60	95.25	92.44

APPENDIX C

SCHOOLS WITHOUT 1:1 TECHNOLOGY SAMPLE STUDENT OUTCOME DATA

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
7	N	88.43	76.65	96.18	96.68
8	N	59.31	43.75	94.44	82.25
9	N	69.87	54.93	94.98	93.03
10	N	47.44	38.06	92.52	84.69
11	N	56.49	43.59	93.83	92.12
12	N	70.62	56.09	95.73	92.27
20	N	50.00	55.56	95.21	91.91
21	N	94.62	77.85	96.35	97.80
24	N	83.73	50.30	95.72	99.31
30	N	76.14	54.02	95.35	91.86
32	N	71.00	61.06	94.87	91.94
34	N	83.02	64.71	98.31	95.00
41	N	79.71	64.18	96.80	95.65
42	N	50.00	36.06	93.56	91.81
44	N	97.56	87.80	97.38	95.65
46	N	90.91	57.06	95.21	95.78
55	N	82.65	56.50	94.95	94.27
58	N	79.03	53.23	96.86	93.62
60	N	85.29	68.18	96.04	98.33
63	N	83.78	69.23	95.89	90.91
64	N	65.00	41.98	96.48	78.13
67	N	70.40	58.06	96.09	92.13
69	N	78.26	68.61	95.47	92.65
71	N	67.47	45.82	93.71	89.76
73	N	88.28	74.40	95.97	91.51
74	N	57.51	45.22	90.97	90.17
75	N	58.68	54.29	92.23	87.41
76	N	15.38	17.31	92.41	
80	N	74.16	53.41	95.22	93.94
90	N	61.57	48.73	92.74	97.01
91	N	82.93	68.29	94.80	96.92
93	N	73.40	58.06	94.84	88.89
94	N	72.55	51.96	93.79	97.59
95	N	68.75	52.08	96.49	93.75
98	N	86.47	82.15	96.01	95.66
99	N	86.81	60.38	97.05	97.48
100	N	89.12	79.38	96.25	96.78
101	N	90.53	86.15	96.07	96.47

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
103	N	46.15	36.36	98.35	35.90
105	N	61.54	16.67	97.63	22.22
111	N	80.11	67.98	95.14	95.27
114	N	82.99	76.67	96.34	98.93
118	N	77.00	73.96	95.47	95.35
120	N	82.42	50.00	95.16	96.15
125	N	69.23		87.16	31.90
128	N	50.00	55.00	94.62	92.86
130	N	86.61	59.15	96.66	97.16
134	N	72.50	47.79	92.22	93.98
137	N	65.51	58.62	94.25	94.23
139	N	76.32	69.25	96.04	93.76
143	N	79.17	74.76	96.18	91.05
144	N	79.27	56.25	95.41	97.40
145	N	44.44	51.02	96.40	100.00
150	N	78.00	63.27	96.08	94.83
153	N	87.57	71.91	97.99	95.51
154	N	51.43	33.02	95.85	75.24
155	N	37.50	45.34	96.37	87.55
156	N	84.03	72.95	94.92	95.51
161	N	65.38	44.55	87.49	91.67
162	N	30.00	6.82	93.92	71.43
163	N	56.13	44.44	94.18	98.08
164	N	22.22	21.80	84.83	87.20
165	N	67.50	55.42	95.10	95.65
166	N	69.10	64.09	96.88	95.74
167	N	84.79	54.68	95.62	92.86
170	N	78.35	60.64	95.72	91.84
171	N	50.00	41.36	94.42	79.56
172	N	65.12	44.89	95.23	88.20
173	N	37.89	23.56	93.35	79.81
174	N	53.04	38.00	95.41	82.46
178	N	62.82	46.05	93.38	93.18
179	N	89.19	66.22	96.80	98.53
180	N	66.57	52.85	92.67	88.35
181	N	60.00		82.12	25.36
182	N	71.63	50.73	93.16	85.87
183	N	77.57	53.64	95.14	82.58
184	N	59.36	42.86	93.58	94.83
188	N	80.60	62.84	96.19	92.74
193	N	84.54	68.86	95.71	96.92
202	N	57.51	51.48	95.56	93.15

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
206	N	71.69	60.32	94.87	88.51
211	N	39.39	17.09	78.23	82.65
215	N	57.14		68.17	18.67
218	N	41.67	24.07	84.37	62.00
219	N	40.54		84.62	22.65
220	N	92.11	85.42	96.30	98.90
221	N	76.92		82.78	25.00
222	N	40.00		79.72	9.59
224	N	58.33	41.53	94.92	94.38
225	N	47.83		85.38	29.33
226	N	88.73	58.90	96.04	90.48
233	N	80.56	36.11	93.55	88.89
234	N	81.97	68.85	97.14	94.87
243	N	82.28	84.15	97.36	88.89
247	N	25.81	52.73	95.03	96.62
248	N	74.58	49.57	95.08	90.76
249	N	64.52	43.33	94.15	100.00
250	N	69.25	55.68	94.79	94.29
261	N	67.20	41.80	96.34	89.30
262	N	52.86	28.36	95.41	84.34
263	N	74.19	61.90	94.05	98.21
264	N	77.55	64.58	94.22	100.00
267	N	76.19	54.42	95.82	89.31
272	N	76.58	53.33	96.21	98.63
274	N	34.62	18.75	76.76	33.00
275	N	86.27	60.82	93.14	94.48
276	N	81.58	68.13	93.62	95.93
278	N	83.61	75.41	98.13	91.59
281	N	68.42	47.71	95.44	92.66
282	N	82.14	65.06	96.15	96.34
283	N	70.00	42.16	95.69	96.19
293	N	80.82	67.94	95.86	95.13
295	N	74.29	61.27	95.10	95.40
298	N	52.94	38.33	92.64	89.59
300	N	60.67	54.13	94.88	91.47
301	N	67.94	59.71	91.99	92.14
302	N	55.60	43.87	90.54	84.53
303	N	37.50	23.27	87.01	85.31
304	N	61.76	49.23	93.89	
305	N	80.00		73.38	0.00
312	N	68.87	60.31	96.19	93.55
317	N	52.50	32.05	93.06	91.46

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
318	N	87.50	66.22	93.39	84.81
322	N	79.41	36.36	92.00	69.57
326	N	17.65	7.14	91.24	81.82
328	N	53.93	47.01	94.80	88.56
329	N	85.71		73.90	26.85
330	N	94.97	84.81	96.59	100.00
331	N	73.53	45.59	93.99	97.18
338	N	100.00	98.72	97.51	100.00
343	N	84.06	60.00	93.21	92.04
344	N	64.06	46.22	93.57	92.74
345	N	85.16	59.66	93.38	92.25
346	N	100.00	30.00	81.73	78.57
347	N	20.00	5.88	79.75	44.83
354	N	73.86	51.72	93.89	87.93
355	N	70.89	54.67	94.86	82.16
356	N	83.65	69.18	95.96	88.72
357	N	69.40	56.82	95.46	94.74
359	N	77.57	65.74	94.95	91.67
365	N	75.00		88.85	21.05
373	N	77.96	65.84	95.88	95.06
375	N	81.71	56.63	95.78	96.04

APPENDIX D

SCHOOLS BELOW THE AVERAGE F/R LUNCH SAMPLE STUDENT OUTCOME DATA

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
1	Y	80.00	29.63	96.88	98.85
2	Y	100.00	68.24	96.27	90.12
3	Y	78.91	75.34	95.09	88.77
4	Y	89.82	80.15	97.04	96.61
5	Y	87.78	72.48	95.91	94.89
6	Y	55.26	50.00	95.06	92.35
7	N	88.43	76.65	96.18	96.68
9	N	69.87	54.93	94.98	93.03
13	Y	68.42	54.89	95.30	87.83
16	Y	73.63	67.79	95.69	90.09
17	Y	64.21	52.23	96.00	89.86
18	Y	75.64	57.14	96.47	100.00
19	Y	78.52	56.76	96.61	93.69
20	N	50.00	55.56	95.21	91.91
21	N	94.62	77.85	96.35	97.80
22	Y	75.36	65.93	96.08	95.80
23	Y	81.74	62.92	94.90	93.42
24	N	83.73	50.30	95.72	99.31
25	Y	81.93	62.65	96.23	94.92
26	Y	77.00	55.43	93.98	89.72
27	Y	85.33	59.46	96.27	88.73
28	Y	80.00	50.48	96.28	96.92
30	N	76.14	54.02	95.35	91.86
31	Y	67.86	50.00	96.02	91.30
32	N	71.00	61.06	94.87	91.94
33	Y	82.00	79.59	95.77	91.67
34	N	83.02	64.71	98.31	95.00
35	Y	80.11	64.41	93.79	92.31
38	Y	81.97	76.19	94.78	94.83
39	Y	59.66	43.36	94.40	92.38
40	Y	71.88	61.29	93.99	97.33
41	N	79.71	64.18	96.80	95.65
44	N	97.56	87.80	97.38	95.65
45	Y	81.58	67.95	96.59	93.06
47	Y	79.87	52.90	95.94	97.26
48	Y	86.49	40.50	95.04	89.29
49	Y	72.37	56.58	94.59	98.53
50	Y	77.11	49.41	95.37	90.00

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
51	Y	69.38	52.20	95.91	99.29
52	Y	68.29	36.14	95.18	94.66
53	Y	68.75	55.80	95.99	97.12
54	Y	72.28	54.41	95.80	89.78
55	N	82.65	56.50	94.95	94.27
56	Y	84.81	63.64	92.68	98.65
57	Y	82.29	61.05	95.69	98.73
58	N	79.03	53.23	96.86	93.62
59	Y	81.95	72.60	95.99	98.11
60	N	85.29	68.18	96.04	98.33
62	Y	96.00	82.69	96.33	97.50
63	N	83.78	69.23	95.89	90.91
65	Y	84.93	65.33	96.63	90.14
66	Y	82.52	69.61	97.88	97.17
67	N	70.40	58.06	96.09	92.13
68	Y	77.53	74.63	97.51	96.15
69	N	78.26	68.61	95.47	92.65
70	Y	62.68	49.30	93.68	95.04
71	N	67.47	45.82	93.71	89.76
72	Y	78.32	63.58	95.18	92.11
73	N	88.28	74.40	95.97	91.51
78	Y	71.43	58.94	94.45	90.84
79	Y	74.03	59.74	95.22	94.29
80	N	74.16	53.41	95.22	93.94
82	Y	70.70	55.05	94.77	91.76
83	Y	75.36	63.24	94.63	88.71
84	Y	73.91	51.11	93.28	97.01
85	Y	84.28	63.46	96.23	91.18
86	Y	67.83	48.95	94.51	87.80
87	Y	74.59	65.57	96.77	97.69
88	Y	79.61	58.42	94.44	95.83
91	N	82.93	68.29	94.80	96.92
92	Y	73.53	57.58	94.93	90.77
93	N	73.40	58.06	94.84	88.89
94	N	72.55	51.96	93.79	97.59
95	N	68.75	52.08	96.49	93.75
96	Y	78.75	58.02	96.35	90.48
97	Y	74.12	62.86	95.77	95.57
98	N	86.47	82.15	96.01	95.66
99	N	86.81	60.38	97.05	97.48
100	N	89.12	79.38	96.25	96.78
101	N	90.53	86.15	96.07	96.47

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
102	Y	83.17	63.40	96.07	95.35
103	N	46.15	36.36	98.35	35.90
104	Y	58.82	35.00	99.09	53.33
105	N	61.54	16.67	97.63	22.22
106	Y	78.97	67.79	95.49	96.92
107	Y	71.94	58.70	96.03	94.90
108	Y	80.36	65.18	95.93	93.26
109	Y	82.97	59.52	95.29	90.96
110	Y	87.10	62.30	96.23	98.28
111	N	80.11	67.98	95.14	95.27
112	Y	80.56	70.56	94.28	92.57
113	Y	66.07	61.11	95.53	91.30
114	N	82.99	76.67	96.34	98.93
115	Y	83.33	70.29	97.00	95.05
116	Y	82.34	63.99	96.16	98.03
117	Y	67.39	45.83	95.24	88.24
118	N	77.00	73.96	95.47	95.35
119	Y	80.25	67.38	96.42	95.31
120	N	82.42	50.00	95.16	96.15
121	Y	69.23	54.31	93.75	82.35
122	Y	84.50	77.52	96.76	97.20
123	Y	82.76	60.34	96.47	98.86
124	Y	80.10	74.63	94.27	96.34
127	Y	73.30	67.72	95.75	91.23
130	N	86.61	59.15	96.66	97.16
131	Y	60.68	54.69	95.31	93.88
132	Y	74.25	57.41	95.57	94.63
133	Y	83.97	70.23	95.22	95.69
134	N	72.50	47.79	92.22	93.98
135	Y	66.24	52.81	94.21	89.91
136	Y	72.29	55.42	94.86	93.83
137	N	65.51	58.62	94.25	94.23
138	Y	75.15	54.55	95.15	95.16
139	N	76.32	69.25	96.04	93.76
140	Y	85.60	67.34	95.95	94.63
141	Y	72.26	47.15	95.24	94.52
143	N	79.17	74.76	96.18	91.05
144	N	79.27	56.25	95.41	97.40
146	Y	70.10	56.61	94.61	97.02
147	Y	69.06	48.03	94.00	95.27
148	Y	73.53	38.57	93.57	87.95
149	Y	71.62	62.31	95.30	92.64

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
150	N	78.00	63.27	96.08	94.83
151	Y	83.49	59.63	96.80	96.00
152	Y	69.12	45.32	94.05	85.06
153	N	87.57	71.91	97.99	95.51
156	N	84.03	72.95	94.92	95.51
157	Y	66.42	59.08	95.05	98.11
159	Y	85.31	75.47	94.87	96.13
166	N	69.10	64.09	96.88	95.74
167	N	84.79	54.68	95.62	92.86
168	Y	80.00	72.27	94.00	94.07
169	Y	90.56	87.69	98.29	97.09
175	Y	67.21	50.82	93.62	95.38
176	Y	73.31	53.02	97.38	94.53
177	Y	71.43	50.00	95.37	100.00
178	N	62.82	46.05	93.38	93.18
179	N	89.19	66.22	96.80	98.53
182	N	71.63	50.73	93.16	85.87
183	N	77.57	53.64	95.14	82.58
185	Y	72.64	60.00	94.58	96.40
186	Y	77.27	64.62	95.52	95.69
187	Y	78.52	58.65	95.93	95.73
188	N	80.60	62.84	96.19	92.74
193	N	84.54	68.86	95.71	96.92
198	Y	86.67	66.67	55.88	31.94
200	Y	65.03	49.26	96.64	91.94
206	N	71.69	60.32	94.87	88.51
215	N	57.14		68.17	18.67
220	N	92.11	85.42	96.30	98.90
226	N	88.73	58.90	96.04	90.48
227	Y	82.61	55.56	95.24	79.17
228	Y	75.29	65.09	96.48	89.57
234	N	81.97	68.85	97.14	94.87
235	Y	79.89	68.57	95.99	93.39
236	Y	76.32	54.67	95.56	91.53
237	Y	80.53	61.06	94.88	93.97
239	Y	77.18	65.35	95.72	92.06
240	Y	86.42	82.59	95.05	96.92
241	Y	78.72	71.16	94.30	96.86
242	Y	88.89	88.89	95.31	100.00
243	N	82.28	84.15	97.36	88.89
245	Y	20.00	58.90	93.43	98.04
246	Y	83.33	55.56	96.01	96.38

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
248	N	74.58	49.57	95.08	90.76
249	N	64.52	43.33	94.15	100.00
250	N	69.25	55.68	94.79	94.29
251	Y	73.99	64.94	95.31	93.20
252	Y	72.65	61.61	94.23	94.90
254	Y	56.52	43.48	95.81	94.44
255	Y	56.40	50.70	94.48	88.11
257	Y	89.19	73.68	96.59	90.48
258	Y	70.00	61.67	95.46	96.67
259	Y	66.98	42.74	96.66	81.71
260	Y	75.38	63.77	96.93	94.83
261	N	67.20	41.80	96.34	89.30
265	Y	73.24	65.38	95.71	98.78
266	Y	77.08	62.77	94.45	96.34
267	N	76.19	54.42	95.82	89.31
268	Y	85.37	67.90	95.84	95.40
269	Y	94.92	71.19	98.39	100.00
270	Y	94.12	76.47	98.14	94.83
271	Y	83.04	79.13	95.25	96.95
272	N	76.58	53.33	96.21	98.63
273	Y	90.91	88.31	96.48	97.18
275	N	86.27	60.82	93.14	94.48
276	N	81.58	68.13	93.62	95.93
277	Y	73.94	60.37	96.86	97.04
278	N	83.61	75.41	98.13	91.59
279	Y	73.40	42.11	95.66	93.07
280	Y	63.27	44.62	93.81	86.21
281	N	68.42	47.71	95.44	92.66
282	N	82.14	65.06	96.15	96.34
283	N	70.00	42.16	95.69	96.19
284	Y	66.44	43.92	95.84	92.97
286	Y	78.26	59.57	97.10	100.00
288	Y	73.91	68.48	94.89	96.30
290	Y	74.73	64.13	95.15	94.95
291	Y	79.03	59.38	95.53	89.83
292	Y	71.43	60.20	97.05	95.45
293	N	80.82	67.94	95.86	95.13
294	Y	84.48	69.77	96.45	97.97
295	N	74.29	61.27	95.10	95.40
296	Y	46.67	75.78	97.06	97.63
297	Y	75.00	59.26	95.02	85.51
299	Y	73.19	63.70	94.90	92.94

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
307	Y	70.16	47.47	95.53	83.51
308	Y	77.55	54.00	94.37	91.43
309	Y	78.95	58.97	96.44	90.48
310	Y	72.22	59.20	96.16	96.49
311	Y	82.98	80.85	96.43	100.00
312	N	68.87	60.31	96.19	93.55
313	Y	81.71	72.73	96.10	100.00
314	Y	75.00	54.44	94.34	88.35
318	N	87.50	66.22	93.39	84.81
319	Y	80.00	45.00	95.87	80.95
320	Y	73.43	58.74	95.57	87.26
321	Y	75.76	47.62	96.24	89.33
323	Y	76.39	57.34	95.10	95.65
324	Y	70.00	54.00	94.48	94.02
325	Y	70.91	53.32	95.76	92.08
327	Y	77.92	68.09	96.20	94.26
330	N	94.97	84.81	96.59	100.00
331	N	73.53	45.59	93.99	97.18
332	Y	59.32	52.31	95.34	97.67
335	Y	73.52	57.37	98.02	92.44
336	Y	70.09	61.82	97.23	93.75
338	N	100.00	98.72	97.51	100.00
340	Y	76.00	70.67	97.28	98.33
341	Y	67.74	40.00	93.82	88.00
342	Y	78.29	64.84	93.65	97.17
343	N	84.06	60.00	93.21	92.04
344	N	64.06	46.22	93.57	92.74
345	N	85.16	59.66	93.38	92.25
348	Y	67.21	57.38	94.82	95.50
349	Y	57.47	44.19	96.41	91.67
350	Y	81.71	67.90	96.01	97.06
352	Y	65.38	57.14	94.40	94.17
353	Y	82.29	67.71	95.58	97.70
354	N	73.86	51.72	93.89	87.93
355	N	70.89	54.67	94.86	82.16
356	N	83.65	69.18	95.96	88.72
357	N	69.40	56.82	95.46	94.74
358	Y	75.00	70.91	95.28	98.72
359	N	77.57	65.74	94.95	91.67
360	Y	75.00	50.53	95.60	95.83
361	Y	60.26	36.14	93.77	86.42
362	Y	75.19	58.78	95.93	94.17

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
363	Y	71.62	62.16	97.11	95.89
366	Y	77.19	67.27	96.13	92.31
367	Y	79.78	65.12	95.85	95.59
368	Y	50.00	68.63	95.62	98.18
370	Y	81.82	63.64	96.78	93.33
371	Y	73.02	63.93	95.89	84.31
372	Y	79.17	42.49	95.81	91.03
373	N	77.96	65.84	95.88	95.06
374	Y	70.37	56.60	95.25	92.44
375	N	81.71	56.63	95.78	96.04

APPENDIX E

SCHOOLS ABOVE THE AVERAGE F/R LUNCH SAMPLE STUDENT OUTCOME DATA

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
8	N	59.31	43.75	94.44	82.25
10	N	47.44	38.06	92.52	84.69
11	N	56.49	43.59	93.83	92.12
12	N	70.62	56.09	95.73	92.27
14	Y	49.58	39.00	92.89	87.39
15	Y	81.94	78.87	96.80	100.00
29	Y	61.79	60.54	95.64	94.24
36	Y	54.69	46.88	94.99	96.74
37	Y	60.41	57.22	92.09	90.23
42	N	50.00	36.06	93.56	91.81
43	Y	73.87	69.30	94.13	86.00
46	N	90.91	57.06	95.21	95.78
61	Y	53.69	41.60	94.14	92.24
64	N	65.00	41.98	96.48	78.13
74	N	57.51	45.22	90.97	90.17
75	N	58.68	54.29	92.23	87.41
76	N	15.38	17.31	92.41	#NULL!
77	Y	58.87	46.53	93.72	88.13
81	Y	65.31	35.42	95.36	93.44
89	Y	63.21	55.24	95.07	96.49
90	N	61.57	48.73	92.74	97.01
125	N	69.23		87.16	31.90
126	Y	58.54	48.26	94.23	82.41
128	N	50.00	55.00	94.62	92.86
129	Y	60.00	51.72	97.83	90.00
142	Y	72.58	62.90	92.39	95.59
145	N	44.44	51.02	96.40	100.00
154	N	51.43	33.02	95.85	75.24
155	N	37.50	45.34	96.37	87.55
158	Y	42.86	35.58	96.68	96.45
160	Y	39.03	33.33	91.34	73.30
161	N	65.38	44.55	87.49	91.67
162	N	30.00	6.82	93.92	71.43
163	N	56.13	44.44	94.18	98.08
164	N	22.22	21.80	84.83	87.20
165	N	67.50	55.42	95.10	95.65
170	N	78.35	60.64	95.72	91.84
171	N	50.00	41.36	94.42	79.56

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
172	N	65.12	44.89	95.23	88.20
173	N	37.89	23.56	93.35	79.81
174	N	53.04	38.00	95.41	82.46
180	N	66.57	52.85	92.67	88.35
181	N	60.00		82.12	25.36
184	N	59.36	42.86	93.58	94.83
189	Y	92.98	61.02	95.45	89.83
190	Y	61.20	46.94	94.55	90.88
191	Y	50.00	31.71	80.49	50.47
192	Y	33.33	0.00	94.31	29.41
194	Y	46.09	34.34	92.47	87.15
195	Y	74.00	51.02	95.41	91.43
196	Y	59.50	45.45	93.49	92.33
197	Y	61.27	51.80	94.20	92.46
199	Y	53.17	31.30	97.98	22.68
201	Y	59.02	49.19	96.52	94.12
202	N	57.51	51.48	95.56	93.15
203	Y	53.80	48.02	95.05	87.77
204	Y	70.63	56.34	95.24	100.00
205	Y	72.05	58.95	93.29	87.12
207	Y	29.17	23.81	92.57	74.51
208	Y	40.63	31.04	86.53	74.11
209	Y	37.50	29.22	94.96	97.17
210	Y	60.66	52.07	93.78	88.79
211	N	39.39	17.09	78.23	82.65
212	Y	24.55	16.11	92.26	73.03
213	Y	23.08	20.37	86.14	63.37
214	Y	40.00	48.78	93.29	98.25
216	Y	35.56	17.81	80.55	63.01
217	Y	25.25	23.53	85.20	65.38
218	N	41.67	24.07	84.37	62.00
219	N	40.54		84.62	22.65
221	N	76.92		82.78	25.00
222	N	40.00		79.72	9.59
223	Y	71.88	65.71	95.78	85.00
224	N	58.33	41.53	94.92	94.38
225	N	47.83		85.38	29.33
229	Y	69.47	58.87	94.72	86.45
230	Y	50.00	21.74	87.93	
231	Y	0.00	0.00	88.47	
232	Y	40.00	35.00	88.00	
233	N	80.56	36.11	93.55	88.89

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
238	Y	35.29	49.44	96.38	97.92
244	Y	40.00	9.09	84.37	35.29
247	N	25.81	52.73	95.03	96.62
253	Y	75.00	54.17	95.12	91.67
256	Y	34.88	39.88	93.78	93.46
262	N	52.86	28.36	95.41	84.34
263	N	74.19	61.90	94.05	98.21
264	N	77.55	64.58	94.22	100.00
274	N	34.62	18.75	76.76	33.00
285	Y	73.33	45.16	95.22	66.67
287	Y	72.07	44.14	94.74	95.51
289	Y	70.59	56.72	95.95	94.92
298	N	52.94	38.33	92.64	89.59
300	N	60.67	54.13	94.88	91.47
301	N	67.94	59.71	91.99	92.14
302	N	55.60	43.87	90.54	84.53
303	N	37.50	23.27	87.01	85.31
305	N	80.00		73.38	0.00
306	Y	67.05	50.57	95.37	89.53
315	Y	73.33	54.35	93.35	77.78
316	Y	73.33	64.24	96.82	88.89
317	N	52.50	32.05	93.06	91.46
322	N	79.41	36.36	92.00	69.57
326	N	17.65	7.14	91.24	81.82
328	N	53.93	47.01	94.80	88.56
329	N	85.71		73.90	26.85
333	Y	54.14	45.60	96.54	88.49
334	Y	70.04	60.47	97.65	94.34
337	Y	24.69	18.09	83.50	19.93
339	Y	62.50	59.34	97.20	87.50
346	N	100.00	30.00	81.73	78.57
347	N	20.00	5.88	79.75	44.83
351	Y	29.41	12.50	98.64	53.66
364	Y	61.64	49.53	93.94	95.74
365	N	75.00		88.85	21.05
369	Y	53.42	50.68	94.20	86.00

APPENDIX F

CHARTER SCHOOLS SAMPLE STUDENT OUTCOME DATA

ID	1:1	ISTEP+ E/LA ECA	ISTEP+10 E/LA	Attendance	Graduation
31	Y	67.86	50.00	96.02	91.30
63	N	83.78	69.23	95.89	90.91
64	N	65.00	41.98	96.48	78.13
103	N	46.15	36.36	98.35	35.90
104	Y	58.82	35.00	99.09	53.33
105	N	61.54	16.67	97.63	22.22
125	N	69.23		87.16	31.90
163	N	56.13	44.44	94.18	98.08
175	Y	67.21	50.82	93.62	95.38
181	N	60.00		82.12	25.36
189	Y	92.98	61.02	95.45	89.83
192	Y	33.33	0.00	94.31	29.41
199	Y	53.17	31.30	97.98	22.68
214	Y	40.00	48.78	93.29	98.25
215	N	57.14		68.17	18.67
218	N	41.67	24.07	84.37	62.00
219	N	40.54		84.62	22.65
220	N	92.11	85.42	96.30	98.90
221	N	76.92		82.78	25.00
222	N	40.00		79.72	9.59
223	Y	71.88	65.71	95.78	85.00
225	N	47.83		85.38	29.33
230	Y	50.00	21.74	87.93	
231	Y	0.00	0.00	88.47	
232	Y	40.00	35.00	88.00	
243	N	82.28	84.15	97.36	88.89
274	N	34.62	18.75	76.76	33.00
304	N	61.76	49.23	93.89	
305	N	80.00		73.38	0.00
329	N	85.71		73.90	26.85
338	N	100.00	98.72	97.51	100.00
365	N	75.00		88.85	21.05

APPENDIX G

PUBLIC RECORDS REQUEST RESPONSE

Mr. Hall,

Please allow this email to serve as records responsive to your December 20, 2016 records request of the Indiana Department of Education ("Department"). At this time the Department considers your request closed.

Note: 2016 graduation rate data is not yet available I suggest you request this information late January.

Sincerely,

Leslie-Ann James

Public Records Officer
Office of Legal Affairs
Indiana Department of Education
ljames@doe.in.gov
(317) 232-6647

APPENDIX H

REQUEST FOR INDIANA TECH PLAN SURVEY DATA

Mark Hall <markhall1993@gmail.com>

Tech Plan

Mark Hall <markhall1993@gmail.com> Mon, Oct 17, 2016 at 8:23 PM
To: jbailey@doe.in.gov

Jason,

I am working on my doctoral dissertation at Ball State. My research is focused on student outcomes associated 1:1 integration in Indiana schools. I am contacting you to see if you have a data file or spreadsheet that feeds the interactive maps on the DOE webpage. I saw the raw data file on the web page but it does not identify the district that the data came from. It would save me a lot of time if the file already exists so I do not have to recreate it by retyping the data on the maps into a spreadsheet.

Just to give you an idea of what I am looking at, I plan to identify all of the schools in Indiana that have reported data, and then statistically compare standardized test scores, attendance rates, and graduation rates to see what impact if any 1:1 integration is having on various student outcomes in our state.

If you have any questions please let me know.

Any help would be greatly appreciated.

Mark Hall

APPENDIX I

INSTITUTIONAL REVIEW BOARD

Gmail Mark Hall <markhall1993@gmail.com>

IBR Exemption

Weaver, Jennifer <jmweaver@bsu.edu> Tue, Dec 20, 2016 at 4:01 PM
To: Mark Hall <markhall1993@gmail.com>

Hi Mark,

Your project as presented is a Program Evaluation which does not meet the Federal Regulations requirement for IRB Review.

If you or your committee have any questions, feel free to contact me.

Thanks,

Jen

Jennifer M. Weaver, MS

Responsible Conduct of Research

Program Manager

Office of Research Integrity

Ball State University

Muncie, IN 47306

765-285-5034

Jmweaver@bsu.edu